Chapter 3 - Affected Environment and Environmental Consequences

Purpose and Organization of this Chapter

Chapter 3 combines two chapters often published separately in environmental impact statements, "The Affected Environment" and "Environmental Consequences." The primary purpose of this chapter is to describe the environment of the Forest and to disclose the effects of the alternatives.

This chapter contains a description of the physical, biological, and social environments on the Forest and the surrounding area. These descriptions include such topics as geology, topography, climate, plant and animal life, and current socio-economic conditions. The chapter is divided into five major categories:

1. Physical Elements.
2. Biological Elements.
3. Use and Designation of the Forest.
4. Production of Natural Resources.
5. Social and Economic Elements.

Each category is further subdivided. For example, Physical Elements is subdivided into four topics: air, heritage resources, soil, and water/riparian/wetlands. For each topic, the applicable statutory requirements, key indicators used for comparing alternatives, resource protection measures, and the affected environment and environmental consequences are discussed.

Many additional items were screened out of the analysis process. The reasons for eliminating them include the following:

1. Analysis of the item was not considered important to the integrity of the Forest environment.
2. Analysis of the item would not disclose direct or indirect effects to the environment.
3. Analysis of the item was not acknowledged or required by law.

Resource Protection Measures

Mitigation measures as defined by 40 CFR 1508.20 include: avoiding the impact altogether by declining to take an action or part of an action; minimizing impacts by limiting the degree or magnitude of an action or its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; and/or compensating for the impact by replacing or providing substitute resources or environments.

Key laws, regulations, and policies are identified in the Revised Plan in Appendices A - C. Applicable standards and guidelines are also found in the Revised Plan. The FEIS will discuss key resource mitigation measures, unconstrained effects, and effects constrained by mitigation. Only those key mitigation measures such as laws, regulations, policies, and forest-wide standards will be discussed in each section of environmental effects.

Key resource mitigation measures should be viewed in a programmatic context. Specific mitigation measures will be developed during individual project analysis.

Monitoring and evaluation will determine the effectiveness of mitigation measures. Please refer to Chapter 4, Monitoring and Evaluation, in the Revised Plan.

Environmental Consequences

This section describes the direct, indirect, and cumulative effects on the environment resulting from activities. It also describes output levels for the alternatives. If a resource management activity has no direct or indirect effect on a particular environmental element (listed above), under any of the alternatives, there is no discussion.

Direct environmental effects are those that occur at the same time and place as the initial action. An example would be on-site soil compaction from rubber-tired skidders harvesting timber. Indirect environmental effects are caused by the action, but occur later in time or are spatially removed from the action. An example would be downwind effects of a power plant on air quality. Actions taken to achieve the goals of a particular alternative, along with past, present and foreseeable future activities undertaken by either the Forest Service or other parties, are called combined or cumulative effects to the environment.

To ensure long-term productivity of the land, the environmental consequences of alternatives are limited by management requirements. Many are founded in law, federal regulations, and Forest Service policy. Other requirements to limit the environmental consequences are called forest-wide standards and guidelines. They apply to all desired conditions within each alternative developed. The alternatives considered in detail, with their attending forest-wide and management area standards and guidelines were designed to prevent extreme environmental consequences.

Relationship Between Programmatic and Site-Specific Effects Analysis

This FEIS is a programmatic document. It discloses the environmental consequences on a large scale, at the planning level. This is in contrast to analyses for site-specific projects. The FEIS presents a programmatic action at a Forest level of analysis but does not predict what will happen each time the standards and guidelines are implemented. Environmental consequences for individual, site-specific projects on the Forest are not described. The environmental effects of individual projects will depend on the implementation of each project, the environmental conditions at each project location, and the application of the standards and guidelines in each case.

The affected environment and environmental consequences discussions in Chapter 3 allow a reasonable prediction of consequences for any individual location on the Forest. However, this document does not describe every environmental process or condition.

Budget Levels

Because activities, outcomes, and effects are sensitive to budget levels, each alternative has been analyzed at two different budget levels. The full implementation, or desired condition level, has a budget that is relatively unconstrained and reflects the desired level of implementation. The experienced budget level analyzes activities, outcomes, and effects with a budget that is constrained to current, experienced levels. The actual constraint is based on a 3-year average of funds allocated to the Forest for fiscal years 1992, 1993, and 1994. Funding by program area was adjusted by alternative to meet the theme of the alternative.

Physical Elements

- Air
- Heritage Resources
- Soil
- Water/Riparian/Wetlands

Air

Introduction

The Routt National Forest is comprised of three airsheds: Medicine Bow, Granby, and Grand Junction as shown on the airshed map, Figure 3-1. The criteria to determine these three airshed boundaries included topography, upper-level air flows, and political/civil boundaries where physical boundaries were not apparent. The Medicine Bow Airshed encompasses the largest portion of the Forest. All airsheds have the potential to be affected by off-site pollution sources, as well as Forest Service management-induced sources occurring on Forest. Relative to off-site sources of air pollution, the Medicine Bow Airshed has the highest potential to be impacted, followed by the Grand Junction and Granby airsheds.

Legal and Administrative Framework

- **The Clean Air Act** - The Federal Clean Air Act, as amended in 1977 and 1990, designates wilderness in existence as of August 7, 1977 (including later expansions) and over 5,000 acres in size as Class I areas. Section 169 (A) of the act requires "the prevention of any future and the remedying of any existing impairment of visibility in mandatory Class I areas...." Within Class I areas, the act protects air-quality-related values (AQRVs) from adverse impacts resulting from air pollution. AQRVs are features or properties that have the potential to be changed by human-caused air pollution (i.e., flora; fauna; soil; water; visibility; odor; and cultural, archaeological, and paleontological resources). The Clean Air Act requires the Forest Service to comply with all federal, state, and local air quality regulations and to ensure that all management actions conform to the State Implementation Plan (SIP). To comply with recently developed regulations under the Clean Air Act, the Forest Service must evaluate all management activities to ensure that they will not:

    - Cause or contribute to any violations of ambient air quality standards.
    - Increase the frequency of any existing violations.
    - Impede a state's progress in meeting their air quality goals.

- **The Wilderness Act** - The Wilderness Act of 1964, and the Code of Federal Regulations developed to implement it, gives the Forest Service the responsibility and direction to manage designated wilderness areas to preserve, protect, and restore, as necessary, natural wilderness condition.

- **The Colorado Air Quality Control Commission's Regulation No. 3, Regulation Requiring an Air Pollutant Emission Notice, Emission Permit Fees** - This regulation includes provisions to address visibility impairment attributable to existing major sources within Class I areas.

The Clean Air Act, section 169 (A) required the federal Environmental Protection Agency (EPA) to produce regulations to ensure reasonable progress toward meeting the national visibility goal for Class I areas where EPA has determined that visibility is an important

value. The Clean Air Act (section 109) gave the EPA the authority to establish National Ambient Air Quality Standards.

The state regulatory agency responsible for air quality is the Colorado Department of Health's Air Pollution Control Division. The state has the primary responsibility for enforcement of EPA's air quality standards. This responsibility is carried out through an SIP.

Key Indicators

- Potential amount of dust created from unpaved roads and trails.
- Fuelwood availability from the Forest.
- Potential acres of wildland and controlled fire.

Resource Protection Measures

The Forest Service is responsible for protecting Class I area AQRVs from adverse effects caused by air pollution. This responsibility is carried out through involvement in the Prevention of Significant Deterioration (PSD) permit process. It includes:

- Identification of sensitive receptors, if any, for each AQRVs.
- Determination of the potential effects, if any, on sensitive receptors from a potential new air pollution source.
- Determination if a potential effect is adverse.

To comply with federal Clean Air Act regulations, the Forest Service will evaluate all of its activities that might impact the Steamboat Springs nonattainment airshed and mitigate emissions where necessary.

Smoke from prescribed burns is managed under a cooperative agreement between the state and the Forest Service. Prescribed burning is planned on days when air quality degradation can be minimized. Smoke dispersion is a key consideration in any decision to implement prescribed burns. Compliance with the agreement ensures that prescribed burning will not violate the state standard for particulate matter.

Road dust will be evaluated on all projects if it is determined to be an air quality issue. Mitigation measures could include type of surface, season of use, daily time use restrictions, road closures, and the use of dust abatement products or road watering.

Affected Environment

Forestwide

Emissions from fire, including prescribed fire, wildfire, and recreational campfires, are the largest sources of air pollution on the Forest. There have been an average of 18 wildfires per year on the Forest from 1971 to 1990. Slash disposal from logging activities have predominantly been accomplished by pushing the excess logging residue into piles and then burning them at a time when the fire hazard is low. The Forest has burned an average of 50 large burn piles per year.

The Forest has burned approximately 100 acres per year using prescribed fires. This is a small prescribed burn program. Prescribed fire is an intermittent source of particulates

that can cause significant short-term visibility problems. The state of Colorado requires a permit before such burning can be conducted.

Based upon 1984 to 1995 Forest fuelwood records, which include both commercial and personal use firewood, there has been a drastic reduction in the amount of firewood removed from the Forest. Since 1990, the amount has decreased threefold because of Forest range burning restrictions and ordinances adopted by the city of Steamboat Springs and Routt county. Firewood removal has leveled off during the last 5 years, with no increase expected in the near future.

Road dust generated from vehicular traffic on 2,068 miles of unpaved Forest roads also adds particulates to the air. In general, these emissions have only caused forestwide air quality concerns in localized areas. Road dust in these localized areas is viewed as a traffic hazard and social issue. During dry periods of the year, high traffic on some roads (Seedhouse Road and County Road #129) can generate localized road dust conditions. Road dust generated by recreational and logging vehicles accessing National Forest System lands through private land is perceived as a problem by some private landowners adjacent to the Forest.

In 1990, the Colorado Air Pollution Control Division and the Forest Service began a cooperative camera monitoring project around the Mount Zirkel Wilderness. The Forest Service's certification of impairment relied, in part, on a review of existing data conducted during early 1993. Exercising an opportunity given to them by law, the Forest Service certified visibility impairment in the Mount Zirkel Wilderness Area in July 1993 to Governor Roy Romer. The Forest Service also named the Hayden and Craig power plants as suspected sources or contributors to the impairment.

Medicine Bow Airshed

The Medicine Bow Airshed comprises approximately 70% of the Forest. It includes all of the Forest except the southwest portion west of Yampa, the Troublesome area north of Kremmling, and the Williams Fork area south of Kremmling. There are five wilderness areas in the Forest's portion of the airshed: Mount Zirkel, Rawah, Platte River, Never Summer, and Neota. Mount Zirkel and Rawah are Class I wilderness areas.

This airshed may be affected by upwind oil and gas development, the Craig and Hayden coal-fired power plants, and local ski area development. Dust from mineral development may also be a factor, in addition to dust from less localized sources in the airshed. Concern has been expressed about smoke from forest and agricultural burning. Sulfate and nitrate deposition from the Craig and Hayden power plant emissions need to be quantified in order to accurately assess air pollution impacts to the Forest. Monitoring air pollution impacts on visibility, aquatics, and terrestrial vegetation (lichens) is a top priority on the Forest.

Air quality in the Mount Zirkel Wilderness is currently impaired. Because of this, the Medicine Bow airshed will receive more emphasis in this document. The air quality monitoring program began in February 1984 and is ongoing. The air quality issues have expanded beyond the Forest boundary. This situation has social, environmental, and economic significance at national, state, and local levels.

The first step in the existing impairment process was to certify impairment. Any federal land manager or the Colorado Air Pollution Control Division has authority to certify visibility impairment in a Class I area if the impairment is suspected to be due to an existing stationary source. In June 1993, the Forest Service, in conjunction with the Air

Pollution Control Division and the EPA/Region VIII, prepared a Technical Background Document Certifying Visibility Impairment in the Mount Zirkel Wilderness Area. The document presented visual and technical monitoring data collected to support impairment certification. The monitoring information included visibility slides, pictures of emissions and existing stationary facilities upwind from the Mount Zirkel Wilderness, wind data, plume modeling, and data concerning acid loading in the snowpack around the wilderness.

In July 1993, the Rocky Mountain Region formally certified that visibility and aquatic ecosystems in the Mount Zirkel Wilderness were being impaired by air pollutants. The decision was presented to the Governor of Colorado. This represents the first time that the Forest Service has taken this action. Photographs, meteorology, modeling, and sulfur and nitrate deposition data made it "reasonable to believe" that two local upwind coal-fired power generation stations, Hayden and Craig, were causing or contributing to air quality impairment. Potentially affected industries, local government, environmental groups and the general public were extensively involved in the certification process through the Zirkel Air Quality Study (ZAQS) group.

U.S. Geological Survey has been conducting snowpack chemistry studies in Colorado since the mid-1980s. Data indicates an increase in snowpack acidity downwind from the coal stations relative to all other high-elevation snowpacks sampled in Colorado. The snowpack downwind from the stations contains about twice the concentration of sulfate and nitrate and about 250% the acidity compared to other high-elevation snowpacks in Colorado. Snowpack samples taken in the spring of 1994 indicate the lowest pH levels measured in the West. There is chemical and isotopic evidence of changes in the snowpack and also in the lakes near the Mount Zirkel Wilderness due to nearby pollution sources.

This change in the snowpack due to chemical action may affect aquatic ecosystems in the Yampa River Valley. The highest sulfate concentrations were measured in those lakes near snowpacks which also had high concentrations of sulfates. This suggests that changes in lake chemistry are directly linked to sulfate deposition in the snowpack. Approximately 25% of the lakes in the Mount Zirkel Wilderness are extremely sensitive to sulfates and nitrates. There is natural buffering at high elevations due to the bedrock geology and shallow soil layers in this glaciated terrain. The pH of the initial snowmelt has not been measured in the affected area; however, research elsewhere suggests that it would be highly acidic. Thus, in aquatic systems that neutralize little of the acidity form the snowmelt, biological aquatic effects are likely in the area downwind of the Yampa River Valley.

The second step in the existing impairment process is to "reasonably attribute" the visibility impairment. The Air Pollution Control Division (Division) determined that a Reasonable Attribution Study was required. The objective of the study was to ascertain whether the cause of, or contribution to, any visibility impairment in the Mount Zirkel Wilderness could be reasonably attributed to emissions from any source or group of sources. A $3,700,000 Reasonable Attribution study began in fall of 1994. The complete final report was issued in June 1996. Because this is only the second time a Reasonable Attribution Study has been conducted, there were few precedents to follow. If the results of the study pinpoint a stationary source or group of sources, the next step in the process is to determine the Best Available Retrofit Technology (BART) needed to reduce pollutants. Before a retrofitting decision is made, the following factors will be

considered: life of the existing power plant, available technology, expected reductions in pollutants, and economic impacts. Courses of action beyond this point are uncertain.

The Forest also cooperates in the National Atmospheric Deposition Program. The major objectives of the program are to characterize the chemical composition of atmospheric deposition in North America and to determine its spatial distribution and temporal trends. This is accomplished through the establishment and maintenance of a nationwide network of monitoring stations. The Routt National Forest contribution to this effort includes weekly data collection at Dry Lake Campground and Buffalo Pass.

Granby Airshed

This airshed includes the Troublesome and Williams Fork geographic areas near Kremmling, Colorado. Most of the airshed is located on the Arapaho/Roosevelt National Forest and is comprised of Class II areas. The airshed is affected by regional haze from the southwest, local haze from mines in the area (Henderson, AMAX and Climax), and ski area development (Winter Park and Silver Creek). There are no proposed sources requesting permits in this airshed. Little information is available on its sensitive resources.

Grand Junction Airshed

This airshed includes the remainder of the Forest which is essentially west of Yampa. The Forest administers the northeast side of the Flat Tops Wilderness (Class I). The Hayden and Craig power plants were thought to be impacting the northern end of the Flat Tops. Monitoring data does not support this, however. Lake chemistry and snowpack sampling results did not show the high levels of sulfate, nitrate, and acidic deposition found in the Mount Zirkel Wilderness.

Wind data from the Technical Background Document for Certifying Visibility Impairment in the Mount Zirkel Wilderness revealed predominant flows from the southwest, west-southwest, and west. These wind flow patterns move toward the Mount Zirkel Wilderness and not the Flat Tops Wilderness.

Additional monitoring, including lichen monitoring, has occurred in the Flat Tops and the Mount Zirkel Wilderness. In July and August 1982, a baseline lichen study was completed by Mason E. Hale Jr. from the Smithsonian Institution. A subsequent lichen survey was completed in 1992. An examination of Hale's lichen collection is necessary before a meaningful comparison of the two studies can be made.

The airshed is affected by emissions from the Grand Junction urban/industrial area, including the Cameo Power Plant, the waferboard plant in Olathe, Western Slope Refining in Fruita, and agricultural burning. It is also affected by oil and gas development in the western portion of the airshed and emissions from the Aspen-Glenwood corridor. Visibility, aquatics, and terrestrial vegetation (lichens) are high priority monitoring candidates.

Environmental Consequences

General Effects

None of the alternatives considered would substantially change existing air quality on the Forest. There are no significant differences in effects to air quality among alternatives.

Air quality is temporarily lowered at developed recreation sites by vehicle emissions, dust, and smoke from campfires. This effect would be similar, and minor, in all seven alternatives.

Air quality would be affected by future oil, gas, and mineral exploration and development. Effects would be short-term and would include engine emissions from drilling activities, possible emissions from flaring gas during well testing, and release of gasses during drilling. The Forest completed an Oil and Gas Leasing Analysis Environmental Impact Statement in March 1993. Refer to this document for the Zones 1, 2, and 3 on the Forest. Zone 4, which was not included in this analysis, has a reasonable foreseeable development (RFD) of one exploratory well and one development well. Significant effects to air resources are not indicated by the analyses for Zones 1, 2, and 3 and the RFD for Zone 4.

Direct and Indirect Effects

Effects from Travel Management - Use of motorized vehicles, particularly on unpaved surfaces, produces vehicle emissions and dust, a temporary and localized effect. Differences among alternatives would be slight. There would be fewer effects in Alternative F because more roads would be closed. The potential for air quality degradation would be greatest under Alternative G because it projects the greatest amount of motorized use.

Emissions from snowmobiles will not vary greatly by alternative and are not expected to produce a measurable effect on air quality.

Effects from Fire Management - Alternatives B and F have the potential for the largest acreage impacted by wildfire and prescribed natural fires. Emission impacts from wildfires are almost always greater than prescribed fires. Prescribed burning increases emissions for the short-term with the intent of reducing wildfires and wildfire emissions in the long-term.

Effects from Timber Harvest and Road Construction - The amount of easily available firewood affects the amount of wood burned in fireplaces and stoves in Routt and Moffat counties. Emissions from this activity have the potential to impact the air quality. The amount of available firewood is expected to change among alternatives. The alternatives with fewer timber harvests and fewer roads built (Alternatives B and F) would have less available firewood and therefore a reduced potential for air quality degradation. The alternatives with the most timber harvest and related roading (Alternative E, A, and G) would make more firewood available and thus increase the potential for air quality degradation.

Cumulative Effects

All areas on the Forest are currently in compliance with National Aimbient Air Quality Standards. However, the Mount Zirkel Wilderness and part of the Steamboat Springs nonattainment area are receiving unacceptable impacts to Air Quality Related Values. Planned activities will be mitigated to prevent cumulative effects from having unacceptable impacts to air resources. The state has the regulatory authority for controlling off-Forest emissions which have the potential to negatively impact resources on the Forest.

Heritage Resources

Introduction

Heritage resources on all federal land are protected by a series of federal laws which were enacted to protect these resources from damage or loss due to federally funded or permitted activities. The public's recognition that these nonrenewable resources are important and should be protected began very early in this century and continues to the present.

Legal and Administrative Framework

Antiquities Act of 1906 - This act protects historic or prehistoric remains or any object of antiquity on federal lands and applies to both cultural and paleontological resources. It imposes criminal penalties for unauthorized destruction or appropriation of antiquities without a valid permit.

National Historic Preservation Act (NHPA) of 1966 - This act protect historic and archaeological values during the planning and implementation of federal projects (CFR 36 800 and CFR 36 60). The law requires the location and identification of cultural resources during the planning phase of a project, a determination of "significance" (based on scientific archaeological values) for potentially affected resources, and provisions for mitigation of any significant sites which may be affected.

Archaeological Resources Protection Act (ARPA) of 1979 - This act imposes civil penalties for the unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources. This law applies to cultural resources.

Native American Grave Protection and Repatriation Act (NAGPRA) - American Indian burials and sacred items are protected by this act. It applies to cultural resources.

Federal Land Policy and Management Act of 1976 Section 102(8) - This act requires that "the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, ...will preserve and protect certain public lands in their natural condition." This law applies to paleontological resources.

Uniform Rules and Regulations (16 U.S.C.G.. 432-433) - These regulations coincide with the Antiquities Act of 1906. They give the Secretary of Agriculture "jurisdiction over ruins, archaeological sites, historic and prehistoric monuments and structures, objects of antiquity, historic landmarks, and other objects of historic or scientific interests" on the National Forest System lands. This law applies to paleontological resources.

Code of Federal Regulations (CFR) 36 CFR 261.9 - This regulation prohibits "excavating, damaging, or removing any vertebrate fossil or removing any paleontological resource for commercial purposes without a special-use authorization."

Key Indicators

- Number of acres surveyed.
- Number of sites located and evaluated.
- Number of sites protected.
- Number of sites stabilized.
- Number of sites interpreted.

Resource Protection Measures

Heritage resources are protected by the NHPA. Prior to any undertaking as defined in 36 CFR 800, all cultural resources are located and evaluated for their potential to be placed on the National Register of Historic Places. Those sites which are determined to be eligible are identified as "historic properties." The State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation must be informed of potential effects to any historic property. Agreement on mitigation of effects to all historic properties must be reached through consultation with SHPO and the Council before any project may take place.

Affected Environment

The total extent of the cultural resource base is unknown as only 15% of the Forest has been intensively surveyed. As of December 1993, cultural resource inventories have recorded a total of 734 individual cultural sites on the Forest, in compliance with NHPA Section 106. Until 1992, the most cultural resource inventories were conducted for commercial timber sales. After 1992, the list of activities requiring cultural surveys expanded to include range allotment plans, proponent projects, and recreation projects. The majority of the inventories completed before 1986 are not adequate for project clearances (as defined in 36 CFR part 800) due to problems with survey intensity, research design, and methodology.

Prehistoric/American Indian Resources

Of the 392 recorded American Indian sites on the Forest, 12 have been field evaluated as "potentially eligible" for inclusion on the National Register of Historic Places (NRHP). The majority of these sites are open lithic scatters, open campsites, or small lithic quarries. Open lithic scatters are sites which have a visible surface component of flaked stone material and stone tools. Open campsites are essentially lithic scatters which have surface features such as hearths or stone circles and stone alignments. Lithic quarries are areas from which the raw lithic/stone material needed to make stone tools was acquired. During the process of acquiring the raw material from outcroppings, flakes and tools were produced. Of all the Prehistoric/Aboriginal sites located on the Forest, only the Windy Ridge Quartzite Quarry, with its associated sites, would qualify for inclusion on the NRHP.

The earliest evidence of human activity on the Forest comes from the Paleoindian period, which lasted from approximately 11,000 to 8,000 years before the present. Paleoindian people are thought to have been largely dependent upon big game hunting, especially during the end of the ice age when the large mammals, such as mammoth,

wild horse, giant ground sloth and ancient bison, were still living. The cultural remains from the Paleoindian period can include open lithic scatters, quarries where the raw material for stone tools were gathered, kill/butcher sites, and campsites.

The Archaic period spans the time period from approximately 8,000 to 2,500 years before present. The first evidence of structures in Northwest Colorado are dated to this period. Cultural remains from the Archaic period include base camps, open lithic scatters, stone quarries, and drive lines at high altitudes.

The Late Prehistoric culture added the bow and arrow to hunting tools, along with the limited use of ceramic vessels. Ceramic sherds are not common, but a few pieces of utility ware have been located near Lynx Pass and near Harrison Creek. Wickiups, probably dating back 110 years, are further evidence of late occupation of the area. The Utes were the historic inhabitants of the area. Arapaho, Shoshone, Cheyenne, and possibly Kiowa utilized the mountains to a lesser extent until the 1700s. After 1810, the Ute and Arapaho competed over hunting territory. In 1879, the White River and Uncomphagre Ute bands were forcibly removed from their traditional lands onto the Uintah/Ouray Reservation in Utah.

Historic/Euro American Resources

Of the 149 historic sites recorded on the Forest, 56 have been evaluated as "potentially eligible" for the NRHP inclusion. The Euro-American cultural remains on the Forest are related to early farming and ranching, the timber and mineral industries, and early federal conservation practices. The majority of the historic sites are directly related to the historic economic development of the area.

Farming and Ranching - Small homesteads were patented on lands before the federal government set aside forested lands. Most of these homesteads remain as private property. Very few of the structures retain enough integrity to be eligible for the NRHP. Historic stock trails used to move sheep and cattle from Colorado into Wyoming are still in use and are now a part of the Forest's developed trail system These stock driveways are potentially eligible for inclusion on the NRHP.

Mining - Mining played an extremely important role in the early Euro-American settlement of northwest Colorado. Although most of the early mines were patented and transferred into private ownership, some of the patents were transferred back to federal ownership. Cultural resources which relate to early mining can consist of the actual mines, debris from mining, or the small boom towns which supported the mines. Evidence of mining and mineral test pits are located throughout the Forest. Many of these remains are not significant.

Timber - The timber resource on the Forest provided the majority of raw material used for construction of towns, ranches, and all buildings constructed by the Euro-American settlers. Remains of sawmills, logging roads, decking areas, tree stumps, and dwellings for loggers are found on the Forest. The vast majority of these sites are not significant, as they are badly deteriorated. The most significant of these sites are the Hog Park Tie Camp area, Ellis Trail, and the Sarvis Creek log flume.

Federal Conservation Practices - Federal conservation on the Forest began in 1905 with the establishment of the Park Range Forest Reserve. The sites which are associated with the Early Federal Conservation period are mostly buildings which were constructed for use by the Forest Service. The majority of these structures are still used

as administrative sites. These site are protected as administrative sites, but most lack a formal determination of eligibility for NRHP inclusion.

Paleontological Resources

The extent of paleontological deposits is unknown at this time. A complete inventory of the possible fossil-laden deposits has not been completed. One potential paleontological resource area on the Forest has been identified. In the late 1970s, a single mammoth femur was removed from the mud at the base of the Yamcolo Reservoir Dam during construction. Little is known about the circumstances of the recovery. However, the excellent preservation of the specimen and the geomorphology of the area suggest the presence of Pleistocene deposits which may contain more faunal material.

Environmental Consequences

General Effects

In all alternatives, the cultural resource program will provide support to all of the resource projects, as required by Section 106 of the NHPA. In addition, the program will include inventory, analysis, stabilization, and public interpretation under all alternatives. Alternatives A, E, and G emphasize commodities and motorized recreation and have the greatest potential to affect cultural resources These alternatives would therefore require the greatest amount of inventory and mitigation.

Areas important to American Indian traditional practices would be considered under all seven alternatives. One such site has been identified on the Forest. Alternatives A, E, and G emphasize commodities and motorized recreation and therefore have the most potential to affect areas of traditional importance to American Indian people.

Management of cultural resources under Alternatives A, E, and G would require more cultural resource inventories and would emphasize protection and mitigation. As a result, more land would be surveyed thus increasing the knowledge of the prehistory on the Forest. Heritage resource activities not required by law and not designed to return funds to the treasury would be minor.

Alternatives B and F have fewer commodity-driven activities. Under these alternatives, cultural resource management would be held to a minimum, limiting the acreage surveyed and the number of resources located. Because recreation is not emphasized, opportunities for the public to enjoy their heritage and nominations to the National Register of Historic Places would both be infrequent.

Alternatives C and D have a moderate amount of commodity-driven activities. Cultural resource management would remain at current levels in terms of the number of cultural resource inventories conducted and sites located. Expanded recreational opportunities would increase opportunities for public enjoyment of the cultural resources.

Direct and Indirect Effects

Effects from Facilities Maintenance - Many of the facilities currently in use on the Forest are historic properties. The maintenance, reconstruction, remodeling, and removal of these properties is considered to be a direct effect to the property. In all alternatives, these activities will be conducted in compliance with the NHPA.

Effects from Fire Protection - Wildfire poses direct threats to historic structures. The suppression of wildfires has the potential to affect historic properties if the fire line runs

directly across historic properties. In all seven alternatives, fire prevention methods which reduce fuel loads (i.e., prescribed burns and salvage sales) are projects that require mitigation measures to comply with the NHPA.

Effects from Land Exchanges - The exchange of federal land for private land has the potential to affect cultural resources. The legal protection for historic properties ends once the land ownership becomes private. In all alternatives, this direct effect must be mitigated, in compliance with the NHPA, before the land exchange takes place.

Effects from Mineral and Energy Development - In all alternatives, the heavy machinery involved in the construction of and access to energy and mineral extraction areas, as well as the actual extractive activities themselves, are direct effects which must be mitigated in compliance with the NHPA. Indirect effects include the potential for vandalism of a site or theft of artifacts during the execution of the project and the increased potential for vandalism and theft due to new public access.

Effects from Range Management - Impacts on archaeological sites from grazing can be divided into two categories: impact to the soil which contains the buried cultural remains and damage and/or displacement of artifacts and other cultural remains located on the surface. Archaeological sites are directly affected by livestock in the form of "chiseling" in damp soils and sloughing/collapse of stream banks. In all alternatives, the direct effects from range management activities will be mitigated in compliance with the NHPA. Indirect effects of grazing include removal of vegetation and trampling-induced compaction. These effects can lead to reduced infiltration, increased runoff, and an increase in vandalism of sites and theft of artifacts, due to increased visibility.

Effects from Recreation - The construction of recreation facilities (campgrounds, trails, comfort facilities, parking areas, etc.) has the potential to directly affect cultural resources. Under all seven alternatives, these direct effects must be mitigated before the initiation of the construction. Indirect effects from recreational management can be positive or negative. The negative impacts include vandalism of sites and theft of artifacts, inadvertent camping directly on sites, and soil erosion. Some of the positive effects are the edification and education of the public about their heritage, which in turn provides public support for the preservation and interpretation of heritage resources. The construction of new trails into areas which previously had little access creates an indirect effect to cultural resources as it opens new areas to recreational activities and increases the potential for disturbance. Impacts to cultural resources in the form of vandalism and theft of artifacts are generally the greatest in areas of motorized use. These threats generally occur within 1/4-mile of a developed road or a two-track road. Motorized access to cultural sites seems to increase the probability of damage to a site. Alternatives A, C, D, E, and G all place a fairly high emphasis on motorized recreation and will therefore have greater indirect impacts on cultural resource sites.

Effects from Timber Management - The heavy machinery used to harvest trees and the actual harvesting have the potential to directly affect cultural resources. Archaeological sites are threatened by the disturbance of the soil. Historic buildings are sometimes threatened by the falling of trees. Direct effects must be mitigated in compliance with the NHPA in all alternatives. Indirect effects of timber harvest include, but are not limited to, soil erosion and compaction. Another indirect effect is the potential for vandalism of a site or theft of artifacts during the execution of the project. Alternatives A, E, and G will require more surveys and mitigation for the protection of historic properties as required by Section 106 of the NHPA. Thus, more sites will be recorded.

Effects from Utility Corridors - The construction activities for utility developments have the potential to directly affect historic properties. In all alternatives, these direct effects must be mitigated in compliance with the NHPA. One indirect effect is the potential for vandalism of a site or theft of artifacts during the execution of the project.

Effects from Wilderness Management - Impacts to cultural resources from the management of designated wilderness is generally restricted to historic structures. Often the management of wilderness requires the removal of buildings. This poses a direct effect if the structure involved is considered to be a historic property. In all alternatives, all direct effects are mitigated prior to the removal of buildings. Currently, most cultural resource inventories are conducted in areas where ground-disturbing projects are proposed. In areas which are managed as wilderness, there are fewer ground disturbing projects. Natural degradation of sites, from erosion and wildfire, for example, can cause damage to cultural resources. Alternatives B, D, and F have larger portions of the Forest managed as wilderness. Although these alternatives reduce the amount of potential damage to heritage resources from management activities, they will also reduce the amount of surveys conducted and thus the number of sites located and protected.

Effects from Wildlife and Fisheries - Impacts from wildlife and fish habitat management activities are generally limited to the project level. These projects include, but are not limited to, prescribed burns, aspen pushes, or commercial sales, and fish structures. Effects which might occur to historic properties are mitigated in compliance with the NHPA in all alternatives.

Cumulative Effects

The laws protecting cultural resources apply to public lands only. Alternatives which emphasize projects and require compliance with Section 106 of the NHPA provide information and protection for significant cultural resources, while similar sites on privately owned lands may be lost.

Soil

Introduction

Soil is a fundamental component of the environment. It is the growing medium for most plants. Soil absorbs and stores water, releasing it slowly over time. It supplies nutrients for vegetation, which in turn supplies habitat for wildlife and other resources. All renewable resources of the Routt National Forest are dependent upon soils. Soil is considered a nonrenewable resource because of the length of time required for its formation.

Conceptually, the quality or health of a soil can be viewed simply as "its capacity to function." More explicitly, the Soil Science Society of America defines soil quality as, "The capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation" (SSSA 1995). To protect/enhance soil quality, everyone must recognize that the soil resource affects the health, functioning, and total productivity of all ecosystems.

The Forest recognized the importance of soils information as an integral part of land management planning and began soil resource inventory efforts in 1980. Since then, soil resource inventories, also known as soil surveys, have been completed on the entire

Forest. The goal is to utilize soils data as much as possible in the revision process so management activities may be blended with the ecological capabilities and potentials of the land.

The primary goal of soil management is to maintain or enhance long-term site productivity. There are five categories of physical soil disturbances that have been found to affect soil productivity. The categories include: compaction, displacement, erosion, puddling, and severely burned. Soil impacts may not exceed 15% of an activity area (USDA Forest Service 1992).

Soils information is used and analyzed at both the forest planning level and at the project level. This Environmental Impact Statement (EIS) presents an overview of alternatives and general effects on the soil resource. When projects are proposed, more site specific soil analysis occurs, and mitigation is based on the potential, capability, and limitation of the soils at the site.

Legal and Administrative Framework

- **The Organic Administration Act of 1897** "to improve and protect the forest within the boundaries..."
- **The Multiple-Use Sustained-Yield Act** set forth the secondary purposes of establishment "for outdoor recreation, range, timber, watershed, and wildlife and fish purposes."
- **The Forest and Rangeland Renewable Resources Planning Act (RPA)** requires an assessment of the present and potential productivity of the land. Regulations are to specify guidelines for land management plans developed to achieve the goals of the program that....insure that timber will be harvested from NFS land only where ... soil, slope, or other watershed conditions will not be irreversibly damaged.
- **The National Forest Management Act** amended RPA by adding sections that stressed the maintenance of productivity and need to protect and improve the soil and water resources, and avoidance of permanent impairment of the productive capability of the land.

Key Indicators

- Erosional index.
- Acres of harvest.
- Type of harvest.
- Miles of road construction.

Resource Protection Measures

In order to maintain long-term soil productivity, soil disturbance should be kept to a minimum, and adequate measures need to be implemented to protect the soil resource. Mitigation measures have been developed to protect the soil resource and can be found in the forest-wide standards and guidelines, timber sale contracts, and best management practices (BMPS).

The Regional Office has developed a Water Conservation Practices Handbook (WCP), which was issued between release of the Draft EIS and this Final EIS. Its direction will apply to all activities in the region. The Revised Plan has incorporated the 17 standards from the WCP as forest-wide standard direction to protect soil, aquatic, and riparian systems from all land-disturbing actions. A copy of the WCP Handbook is available on request from any Medicine Bow-Routt Forest office. Analysis of effects is based on implementation of these standards.

Resource protection measures apply to all alternatives. For timber harvesting, resource protection measures include winter logging and the use of designated skid trails. For road construction, protection measures include seeding and the construction of water bars to control erosion.

Monitoring is a part of project planning and implementation. A key part of monitoring is to determine if the mitigations are working and protecting the intended resource.

Affected Environment

The Routt National Forest has more than 200 different soil types (USDA Forest Service 1994). Soil formation is dependent on five factors: parent material, topography, climate, organisms, and time. The Forest has so many different soil types because it has a wide range of parent material (more than 60 geologic formations), a wide range in elevation (7,000 to 13,000+ feet), a wide range in precipitation (15 to 65+ inches), dramatic topographic variations, and finally a range in time during which soil formation has been taking place. At high elevations, vegetative growth and microbial activity are restricted due to the short growing season and high snow pack. Under these conditions, the rate of soil formation is much slower than in the more temperate lower elevations. These high-elevation soils are generally not as well developed or as fertile as those occurring at lower elevations.

Soil Productivity

Soil productivity varies widely due to varying characteristics such as soil depth, available water holding capacity, nutrients status, and site characteristics, including elevation, slope, and aspect. The most productive soils are found in valley bottoms and on toeslopes and benches.

The concept of productivity includes both the ability to grow vegetation as well as the maintenance of slope stability. In some areas, past practices have slightly reduced growth potential from compaction, nutrients loss from fire, and loss of large woody material. Soil productivity is the principal area of concern on the Forest, because it can be affected by management activities.

The future of soil productivity will be influenced by the effects of management practices. The demand for many forest resources, which are dependent on soil productivity, is expected to increase in the future.

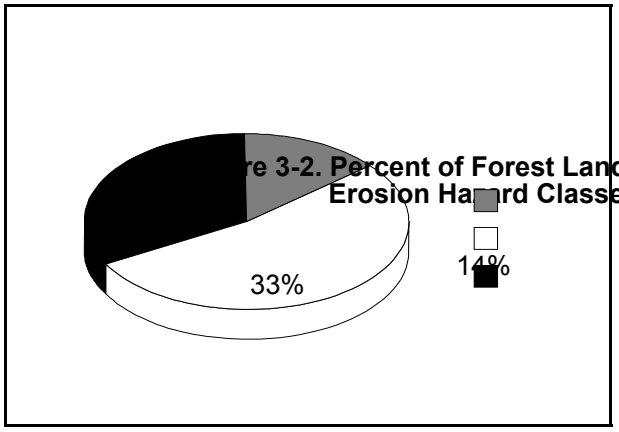
Soil erosion, soil compaction, and organic matter content all determine the productivity of Forest soils. The following section describes these processes/factors and their influence on productivity.

Soil Erosion - Soil erosion is the origin of most of the delivered sediment to streams. This sediment can have negative effects on water quality and fish habitat. The primary cause of soil erosion is overland flow from spring runoff or high intensity storms. Without

overland flow, there is very little erosion. Wind erosion may occur on some exposed wind scour ridges, if the soil surface is exposed and unprotected.

Timber harvesting, site preparation, fuels treatment, and road construction remove or rearrange organic matter which changes erosion rates. Surface erosion rates depend on such factors as soil erodibility, steepness of slope, slope length, and amount of bare ground. Erosion rates may be calculated at project levels, but not at the forest scale.

Figure 3-2 shows the erosion hazard groups for the Forest. This includes all lands, forested and nonforested. This information is based on the Forest's soil resource inventory. The majority of acres (53%) are in the moderate erosion hazard class, followed by 33% in the high erosion hazard class, and 14% in the low erosion hazard class.



re 3-2. Percent of Forest Lands
Erosion Hazard Classes

Mass movement of soil (geologic hazards) include slumping, slope failure, and earthflows. The geologic hazards with the highest probability of mass movement potential have special management implications. Descriptions of the slope stability, or potential for mass movement, have been, and will continue to be, used as an indication of the types of management practices and mitigation measures which are appropriate for the site.

This information is based on the landform and geologic hazard mapping that was done for the Forest (Miller 1977). Figure 3-3 shows the amount of available land suitable for timber production in the three slope stability classes.

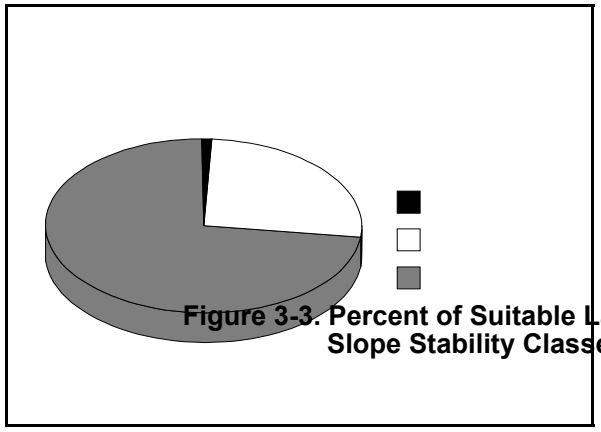


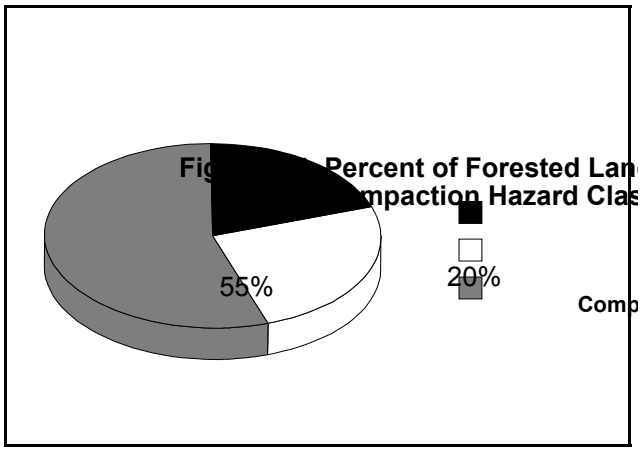
Figure 3-3. Percent of Suitable Lar
Slope Stability Classes

Approximately 73% of the Forest is in the stable class, thus no special measures are needed. The 26% in the moderately stable class requires more work in the layout and design of roads and increases road construction cost. The most potentially unstable group is 1% of the Forest. These areas are generally avoided because the risk of resource damage is higher than the benefit (Warrington 1981). These acres are removed from the tentatively suited timber base. More information on the process can be found in Appendix B "Description of the Analysis Process".

Vegetation plays a major role in the complex interactions of slope stability, as well as erosion. It acts to intercept and store significant amount of precipitation, thereby buffering the effects of storm events. The roots of vegetation physically bind soil particles together; the strength of roots adds strength to the soil; and the roots may grow to bedrock, forming an effective anchor system. Once precipitation enters the soil it becomes available for the vegetation to remove it through evapotranspiration, which decreases the amount of destabilizing groundwater (Swanson, et al. 1989).

Soil Compaction - Soil compaction can significantly reduce long-term soil productivity, therefore it is important to prevent unnecessary compaction. Compaction often occurs as a result of management activities, thus, it is important to stay within acceptable standards in order to minimize the overall effect. The Soil Management Handbook (FSH 2509.18 R2) defines detrimental compaction as a greater than 15% increase in the average undisturbed soil bulk density. It is believed that an increase of 15% or more would represent a loss of soil productivity.

Figure 3-4 shows the soil compaction potential on the Forest. The potential is based on soil characteristics such as amount of rock fragments, thickness of the duff layer, and soil texture.



Some soils are more easily compacted than others, and most soils are more easily compacted when moist than when dry. Compaction in forestry operations most often occurs as a result of the use of ground skidding equipment or equipment used to pile the residue after timber harvest. Each trip across the same location with a piece of machinery or log will cause some compaction. The effects are cumulative, with each succeeding trip increasing the compaction. Because it reduces soil productivity in terms of the amount of timber and forage the land can produce, compaction is not desirable for the Forest in general.

Organic Matter - An important component of soil productivity is organic matter content and related nitrogen availability. Soil organic matter affects both water and nutrient holding capacity and reduces the erosion hazard. Organic matter holds many times its weight in water and has a high cation exchange capacity that increases the soil's ability to retain nutrients for plants. As soil organic matter (leaves, needles, and twigs) decomposes, it releases nutrients, especially in higher elevation soils. Nutrient losses are of concern because if nutrient levels are allowed to decline, the productivity of the site is reduced. These losses most often occur as a result of erosion losses of the surface horizon, volatilization by fire, or whole-tree harvesting.

Large woody material (3 inches) support the life cycle of symbiotic soil fungi (ecto-mycorrhizae) which attach to conifer roots, and greatly increase the tree's ability to take up nutrients and water. Duff and litter on the soil's surface also act as a mulch and reduce soil erosion due to rainfall impact. Fine rootmats in the surface soil bind the soil together, reducing downslope soil creep and washing. Some forest soils have accumulated very little organic matter and are considered sensitive to any organic matter removal by management. These soils generally occur in the upper elevations where the colder climate and short growing season do not generate large amounts of annual vegetative growth.

Environmental Consequences

Method of Analysis for Environmental Consequences

To determine the effects of management activities on the soil resource, an erosional index was calculated for each alternative. This will allow better comparison of the

alternatives by using soils information. For each of the prescription watersheds, the soil erodibility factor was calculated. This is based on average slope of the watershed and the soil erodibility factor. Using FORPLAN outputs, which estimate the acres of watersheds scheduled to be harvested, an erosional index was calculated for each alternative. This erosional index is a unitless number for comparing the different alternatives at a forest-wide scale. It is not a prediction of actual soil erosion in tons or tons per acre. It simply indicates the relative degree to which the FORPLAN model selected stands with steeper slopes or higher erodibility factors. It is not spatial, so the estimate is simply an index for comparison of alternatives. The higher the erosional index number, the greater potential for soil impacts.

For the effects analysis, there are varying degrees of difference in the predicted estimated levels of implementation. The full implementation level is the level of activities that the FORPLAN model predicted with the different constraints applied. This is the biological output for the alternative based on the management area prescription allocations and resource protection constraints. The experienced budget level outputs are reduced by the amount of dollars that are allocated for timber management by the alternative. The dollar value is based on the average from the past 3 years. This value is then adjusted up or down for each alternative based on its theme. From a soil resource standpoint, both the full implementation and experienced budget levels are analyzed. The budget level could change during the planning period, but it will not go above the full implementation level. The experienced budget level is always lower than the full implementation level, except in Alternative F where the two levels are the same.

General Effects

Litter, humus, soil wood, and certain key properties of the surface mineral layers of forest soils are usually most critical when developing silvicultural systems. These are the soil layers most easily and commonly disturbed by silvicultural activities, yet they are the most crucial to forest productivity (Graham, et al. 1991).

Coarse woody debris physically protects the soil from erosion, displacement, and compaction. In addition, it can protect a regenerating forest from both abiotic and biotic elements. Coarse woody debris provides shade and protection from wind and snow and can be a critical factor in protecting newly established seedlings from livestock and other large animals.

The silvicultural methods available to manage the forest need to be assembled into complete silvicultural systems, planned programs of treatments to be applied throughout the life of a forest stand. This is important in ecosystem management. Soils are critical to the regeneration, productivity, nutrients values, and moisture-retention abilities of all forest sites.

The choice of regeneration methods is, in many ways, the most critical decision regarding the entire system. It should be selected by considering all abiotic and biotic elements that might influence forest regeneration and development, but soil properties are especially important. Physical properties of the mineral soil, especially water-holding capacity, can be used to help determine which regeneration methods would be appropriate. For example, stands located on soils with high amounts of available water would be most suited to the clearcut methods, and stands on droughty soils with little available water would be more appropriate for selection or shelterwood methods. This is not to say that soil is the only factor that should be considered when selecting a harvest method, but only that soils should be used as input in the decisions. Silvicultural

prescription in some cases may depend more on the shade tolerance of the tree species. Table 3-1 shows the different types of silvicultural systems by alternative.

Table 3-1. Silvicultural System Percent by Alternative

Silvicultural System	A	B	C	D	E	F	G
Clearcut	64	57	64	65	64	72	66
Shelterwood	18	21	21	19	19	12	20
Selection	18	22	15	16	17	16	16

Source: Routt FORPLAN Model

Many public forestry agencies have shifted from even-aged to uneven-aged management, primarily because of the public perception that uneven-aged management is less damaging to the environment, better for wildlife, and will result in a more aesthetically pleasing landscape. Many forest structural attributes are retained with uneven-aged management because fewer trees are cut at one time in a given area. However, silvicultural operations, such as weeding and thinning, are necessary to allow reasonable growth rate for replacement trees.

Harvey, et al. (1994) stated that with uneven-aged management, the potential for soil damage increases because, with fewer trees removed over larger areas, ground-based extraction to avoid excessive cost is mandatory. With this forest management approach, potential excessive soil damage threatens long-term wood production. Short- and long-term growth reductions from traffic-induced soil compaction and soil displacement are expected. No "final removal" of the stand is made in uneven-aged management.

Table 3-2 shows the number of entries into a spruce/fir stand between a three-step shelterwood and group selection for both management area prescriptions 5.11 and 5.13. As Harvey, et al. noted, the potential for soil damage increases with uneven-aged management, and this can be seen from the number of entries for these management areas.

Table 3-2. Comparison of Harvest Entries by Silvicultural System

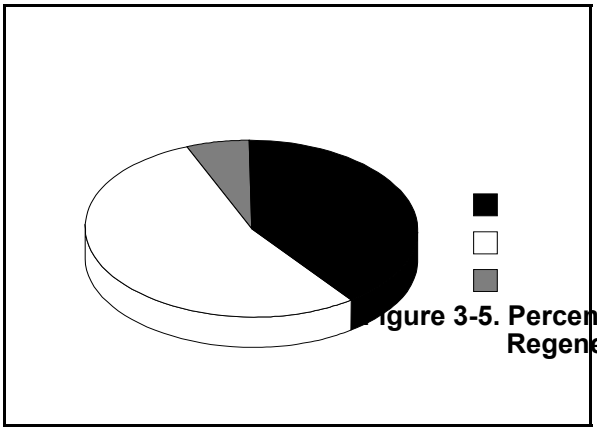
Mgt. Area	Species	Rotation Age	Even-aged*	Uneven-aged**
5.11	Spruce/fir	200	3	8
5.13	Spruce/fir	100	3	5

* using three step shelterwood
** 30 year cutting cycle in 5.11 and 20 year cutting cycle in 5.13

Source: Routt FORPLAN Model

As mentioned above, the ability of a soil to hold water is an important factor in the success or failure of the regeneration method. Figure 3-5 shows the percent of the forest soil type by regeneration class, low, moderate or high. This is based on soil texture, depth and rock fragments.

Specific soil characteristics need to be included in system planning; for example, the amount of soil disturbance necessary to establish and grow specific forest vegetation. Some factors, such as forest floor depth and condition of residue, are highly variable. Trees can be planted successfully near and through surface organic materials provided good root-to-soil contact is made and the soil medium is moist. Likewise, depending on the desired vegetation, very little disturbance may be needed for natural conifer regeneration (Graham, et al. 1991).



igure 3-5. Percent o
Regenera

Tractor piling of logging debris and machine site preparation is used throughout the West. Similar to tractor yarding, tractor piling can detrimentally impact the soil. The greater the disturbance, the greater the potential loss of surface organic layers. A balance is needed to achieve the level of disturbance required for site regeneration while minimizing adverse impacts from that disturbance.

After the site preparation and hazard reduction treatments are completed, it is imperative to leave sufficient large woody material on the site. As mentioned earlier, residue has several properties important for maintaining forest productivity. Graham, et al. (1991) recommend leaving a minimum of 10 to 15 tons per acre of large woody material after timber harvesting and other site treatments. These recommendations are general and will be refined as more research make them more site-specific (Graham, et al. 1994).

Direct and Indirect Effects

Effects from Fire Management - Wildfire is a natural process, which can cause many impacts to the soil resource, including erosion and severely burned soil (DeBano 1991).

Wildfire can have serious short-term implications for soil and watershed protection. Severe wildfires not only destroy vegetation, but can detrimentally burn soils. Soils are considered detrimentally burned when most woody debris, litter, duff, and humus are consumed down to bare mineral soil (USDA Forest Service 1992c). Detrimental burning reduces soil productivity. Gully formation, shallow slumping, and decreased microbial activity may result.

In the aftermath of wildfires, streamflow may increase in response to soil and vegetation changes. A severe wildfire may create hydrophobic soil conditions which decrease the infiltration capacity. This decrease in the soil's ability to absorb water combined with reduced transpiration resulting from vegetation removal can result in significant streamflow increases. If the resulting streamflow causes streambank instability and undermines the integrity of downstream structures in the floodplain, soil erosion will occur. This is particularly important in forested areas where intense thunderstorms can create considerable overland flow if infiltration capacity is reduced.

Severely burned areas would need emergency treatments to prevent watershed and soil degradation. The Forest has a burned area emergency rehabilitation program and plan that would respond to watershed concerns after a major wildfire (USDA Forest Service 1995). This would be true for all alternatives. Alternatives B and F have greater potential for wildfire impacts due to the amount of roadless areas.

For prescribed burning, the same potential hazards exist as described for wildfires. The areas selected for burning are usually small enough and burn cool enough so that widespread adverse effects are minimized, and effects usually are not as severe as those resulting from a major stand replacement fire.

Prescribed burning can affect the physical and chemical nature of the soil. The amount of soil erosion after a prescribed burn depends on the inherent erodibility of the soil, intensity of the fire, the amount of soil exposed, rainfall intensity, length of time the soil is exposed, slope steepness and length, amount of remaining litter and debris, and vegetative recovery period. Project analysis and monitoring would be completed for all prescribed burn proposals so that long-term soil productivity would not be impaired. Prescribed fire programs in all alternatives can be implemented in a way that prevents excessive soil erosion.

Effects from Range Management - In the Eastside Forest Ecosystem Health Assessment (Johnson et al. 1994) the discussion on vegetation stated that perhaps livestock grazing at the turned of the century has caused the greatest degree and extent of disturbance in the western United States. The mobility of the various ungulates across western rangeland has affected virtually all segments of the landscape to some extent. The effect has been greatest along watercourses, in basin meadows, and on ridgetops, where stock driveways and bedding grounds were used season after season for many years. The degrading of native vegetation in these areas has been so complete that thresholds were passed, leaving disclimactic vegetation. This "new" vegetation is usually either simpler biologically than the native flora, or composed of invasive, less desirable, or noxious plants.

Under a properly managed grazing system, livestock are well distributed, grasses are grazed to a preferred use, and trailing is minimized. There are plenty of grasses left for soil protection.

When grazing systems are not properly managed, riparian areas may be heavily grazed and streambanks become raw and erosive. When too much use occurs, upland soils may become compacted and the loss of vegetation can result in increased erosion. Excess trailing can result in rilling which would not maintain the integrity of the ecosystems.

An analysis of range conditions on the Forest showed that approximately 2% of the rangelands are not meeting forest plan direction. This indicates that soils may be exceeding allowable soil loss limits in some locations. Soils information is vital to issuing allotment permits and would provide site-specific information at the project level. Changes in amount and timing of use, pasture rotation, deferment, resting, and closing allotments may all be appropriate means to reduce grazing-related erosion problems.

Soil surface characteristics are currently the best available indicators of soil stability and watershed function. Soil surface characteristics, such as presence of rills and gullies or pedestaling of plants, have been widely used as indicators of the degree of soil movement and condition of the soil surface. An evaluation of soil stability and watershed function, using soil surface characteristics as indicators of soil erosion and runoff, should

become a fundamental component of all inventory and monitoring programs for rangelands (National Research Council 1994).

With cattle grazing occurring over large areas of the Forest in all alternatives, the possibility for erosion exists. Erosion takes place on livestock trails to watering sites or favored crossings, such as over roads, ridges, and streams. In some areas, overgrazing has resulted in soil compaction. These effects would be similar under all alternatives except F.

Effects from Recreation Management - Overuse of campsites can cause soil compaction and deterioration of the vegetation. Both the compaction and vegetative deterioration can lead to increased surface-water runoff and gully formation. This situation presently occurs in some developed recreation sites or at frequently used, dispersed recreation sites, such as campsites near streams. These effects are expected to be similar under all alternatives. Effects can be mitigated by surface treatments (the application of gravel or paving) for heavily used footpaths or by closing areas to dispersed camping. Mitigation would be applied under all alternatives.

Currently, there are 922 miles of recreational trails on the Forest. Since vegetation is removed from trails and compaction occurs, either during construction or by use, trails increase the potential for erosion. Where trails descend/ascend steep slopes, gullying may occur. Effects can be mitigated by proper trail reconstruction, proper cross-drainage, barriers, and interpretive signing. Some indirect adverse impacts can result from trail construction. For example, as access increases, so does off-trail hiking and biking on previously undisturbed areas. This can increase soil erosion, gullying, and compaction. Interpretive signing and barriers are examples of mitigation that can help reduce the amount of off-trail use.

Off-highway motorized recreation has the potential for heavy impacts to the soil resource. Such use disturbs grasslands and forest floor vegetation. When use is heavy or concentrated along corridors, ground cover tends to be damaged without the opportunity to recover. Soils are compacted and, in some instances, the top soil layer is lost. Heavy use on unstable soils or steep slopes has caused soil erosion, permanent loss of ground cover, and gully formation.

There is concern that off-road recreation, especially off-highway vehicle (OHV) and snowmobile use, damages soil and water resources. Because the areas affected are so small and scattered, the effects on soil and water are negligible at the forest-wide scale. In general the impacts occur when users do not comply with existing regulations; for example, OHV use occurring off designated travelways. Effects will be further mitigated by incorporating the watershed conservation practices identified under forest-wide standards in the Revised Plan. During implementation of the forest plan, site-specific project analyses will identify and address localized adverse effects from snowmobiles and other OHV uses. Effects from recreation use would be similar in all alternatives, with the exception of F which would restrict recreationists' movement through the forest.

Effects from Timber Harvesting and Road Building - Table 3-3 shows the harvest levels for the alternatives. This includes the full implementation and experienced budget levels. Aspen is a minor component and is also analyzed in all the alternatives.

Table 3-3. Harvest Volume by Alternative - Full Implementation and Experienced Budget Level per Year

Conifer	A	B	C	D	E	F	G

Full	23.0	9.4	14.8	17.1	26.0	4.9	22.6
Experienced	11.8	6.8	10.1	10.6	12.0	4.9	12.4
Aspen							
Full	2.0	1.0	2.0	1.0	2.0	0.0	2.0
Experienced	1.0	1.0	1.0	1.0	1.0	0.0	1.0
Total	12.8-25.0	7.8-10.4	11.1-16.8	11.6-18.1	13.0-28.0	4.9	13.4-24.6

Source: FORPLAN

Timber harvesting affects the soil in many ways. Activities such as skidding, decking, site preparation, and machine piling of slash results in various degrees of soil displacement, soil compaction, and disturbance to vegetative ground cover. Within a cutting unit, regardless of silvicultural prescription, skid trails can lead to erosion and gullying if not properly located and water-barred or if insufficient slash is left on the skid trail surface.

The effects of equipment operation will result in varying degrees of disturbance or removal of the existing vegetation, litter, and humus from the surface of the soil.

When individual projects are planned, site-specific soil characteristics are taken into consideration. Some soil characteristics will restrict where timber harvesting can be done. Soil characteristics may also require specialized harvesting methods. Where soils are highly erosive or unstable, care must be taken to keep soils in place. Slash should be lopped and scattered on some soil types to maintain nutrient and organic material.

Timber harvest can affect the soil productivity through heavy equipment compaction to the soil and through the removal of nutrients in the form of tree boles, limbs, and branches. Heavy equipment on the forested site can result in detrimental puddling, compaction, erosion, and displacement. In addition to these direct effects, damaged soil can lead to increased runoff from lower infiltration rates, sedimentation, lower permeability, and reduced site productivity.

Timber harvest on the Forest is done by conventional tractor logging or by mechanized whole-tree logging. Conventional tractor logging is done whereby trees are felled, limbed, and bucked with manually operated chainsaws at the stump. A crawler tractor or rubber-tired skidder then drags the logs to a landing where they are loaded onto a logging truck. In mechanized whole-tree logging, trees are felled and bunched by swing-boom or drive-to-tree feller-bunchers. Skidders or tractors then skid bunches of whole trees to roadside landings where they are limbed, bucked, and stacked for later hauling. Limbs, leaves and other log debris are usually burned at the landing site. Each system has different effects which are discussed in this section.

The amount of soil erosion occurring within a timber sale depends on the amount of bare soil, slope steepness, slope length, inherent erodibility, and rainfall intensity. Slash and logging debris that remains after a timber sale reduces erosion because it protects the soil from raindrop impact and presents physical barriers to soil movement. If logging activities expose too much soil, then erosion becomes excessive and site productivity is reduced or impaired.

The road building activities associated with timber management can impact the soil resource. Road construction and reconstruction require that the soil be excavated, cut through, and reshaped by heavy equipment. When the vegetation is removed and bare soil is exposed, there is an increased chance that erosion will take place.

In some cases, road reconstruction may be beneficial, particularly if it corrects drainage problems. In many cases, road reconstruction removes vegetation and reshapes the road surface. For these reasons, reconstruction is counted as an impact rather than a benefit.

Table 3-4 gives the acres harvested by alternatives and erosional index for both the full implementation and experienced budget levels. From this table the ranking of alternatives from greatest to least potential for erosion would be E, A, G, D, C, B, and F.

Table 3-4. Summary of Harvest Acres Disturbed and Erosional Index (EI) for Timber Harvest by Alternative per decade

Alternative	Full Implementation		Experienced Budget Level	
	Acres harvest	EI	Acres harvest	EI
A	25,530	519,321	12,940	260,774
B	11,560	250,634	8,930	199,462
C	17,190	373,898	11,260	240,164
D	17,830	372,814	11,560	242,069
E	28,500	562,709	13,140	276,997
F	5,200	102,952	5,200	101,007
G	24,970	507,789	13,400	280,649

Source: Harvest acres from FORPLAN

The choice of silvicultural systems can affect soil characteristics. Clearcutting creates immediate impacts and is generally a one-time event. In other systems, such as shelterwood and selection, impacts are added incrementally. In shelterwood and selection systems, the designation of skid trails can reduce the cumulative effects of incremental entries into the stand.

Use of designated skid trails can also reduce the amount of soil exposed by certain harvest activities. According to Childs et al. (1989), the amount of soil exposed by tractor yarding was 20 to 40% of the area. The use of designated skid trails reduced the amount of exposed soil to 7- 15% of the area.

The greatest potential for erosion in timber sales comes from roads. Some good indicators of erosion are the road miles and acres cleared for roads. Table 3-5 displays the total road miles by alternative and the estimated acres of land cleared for full implementation level.

Table 3-5. Miles of Road Construction/Reconstruction and Acres of Land Cleared at Full Implementation Level per Decade

	A	B	C	D	E	F	G
Miles of Roads (Timber & Recreation)	374	196	264	271	404	63	364
Road Acres Cleared	805	396	551	567	872	143	780
Erosion Index (Roads)	14,540	6,678	9,460	9,780	15,880	2,717	14,040

Source: Road miles from FORPLAN . Includes estimated reconstruction related to recreation activities

Alternative E has the greatest potential impact from roads with the highest erosional index followed by A, G, D, C, B, and F. The Forest would mitigate the effects of road construction and maintenance through the use of best management practices (BMP) and standards and guidelines in the Water Conservation Practices (WCP) handbook.

Effects from Travel Management - Motorized vehicle use on designated travelways and off-road uses have the potential to adversely impact soils through loss of vegetative cover, erosion, and compaction. Road closures should re-establish proper drainage, remove structures requiring long-term maintenance, and restore vegetative cover that would stabilize soils and reduce sedimentation. Road closure techniques may vary, but it is essential that soil and water objectives be met in the selected closure method.

Motorized off-road uses do not cause damage if the use is minimal and infrequent. However, once the vegetation has been imprinted with wheels, the potential for additional use and resource impacts (including erosion and compaction) increases. For this reason, motorized use is restricted to roads and trails in all alternatives unless specifically allowed by forest order.

Uninventoried two-track roads exist on the Forest, but are generally limited to concentrated areas of high use. These roads are not part of the Forest road system and are not designated for motorized use. These roads are the result of hunters, wood gatherers, firefighters, timber cutters, and others driving off designated travelways. As management activities occur, these roads will be identified and obliterated or placed on the Forest road system. Obliteration of two-track roads (both uninventoried and inventoried) will have a positive effect on long-term soil productivity and will reduce overall open-road density on the Forest.

Cumulative Effects

The effects on soils from all major ground-disturbing activities expected to occur under the alternatives for the next decade are shown in Table 3-6.

Source: ASQ, harvest acres and road miles from FORPLAN, Oil and Gas acres from GIS (ARC/Info)

Table 3-6. Primary Activities Affecting Soils - Full Implementation Level per Year

Activity	Unit	A	B	C	D	E	F	G
Timber Harvest								
Harvest Volume Including Aspen	MMBF/yr	25.0	10.4	16.8	18.1	28.0	4.9	24.6
Even-aged	Acres	2132	936	1484	1478	2330	406	2119
Uneven-aged	Acres	421	995	235	305	520	114	378
Total	Acres	2,553	1,156	1,719	1,783	2,850	520	2,497
Timber Roads								
Construction	Miles	25.6	11.1	16.5	17.1	27.9	5.0	24.7
Reconstruction	Miles	6.2	2.9	4.3	4.4	6.9	1.3	6.1
Recreation Reconstruction	Miles	5.6	5.6	5.6	5.6	5.6	0	5.6
Total	Miles	37.4	19.6	26.4	27.1	40.4	6.3	36.4
Grazing	MHDM	234.8	203.4	216.1	216.1	234.9	178.1	234.8
Oil and Gas Leasing	Acres	1,095,200	933,200	1,084,700	1,031,900	1,046,100	311,300	1,046,100

Alternatives can be evaluated on a cumulative effects basis in terms of the amount of activity in the same area. For timber harvesting, those alternatives with the greatest multiple entries to the same area would potentially have the greatest cumulative effects. Each alternative differs in the relative amount of these activities scheduled.

The effects above show estimated future disturbance differences between alternatives. Yet, watersheds have been impacted to some extent by past management efforts. A discussion of cumulative effects to watershed is contained in the Water Resources section.

Water/Riparian/Wetlands

Introduction

Water is an essential physical resource in the arid and semi-arid western United States. Water is the lifeblood for human consumption, habitat for water dependent species of plants, animals and other aquatic life, which in turn support many terrestrial wildlife species in the West. Basins of which headwaters flow from National Forests, supply much of the water used in the western United States.

The Routt National Forest, straddling the Continental Divide in northwest Colorado, includes the headwaters of three important river systems. The North Platte and Yampa Rivers originate entirely on the Forest; the Middle Park area contributes water to the upper Colorado River. The North Platte River, part of the Platte River Basin, is located east of the Continental Divide, while the Yampa River and Colorado River, both part of the Colorado River Basin, are west of the Continental Divide. Per-acre water yields from the Forest are higher than any other forest in the USDA Forest Service Rocky Mountain Region. This water is predominantly high-quality surface water and is put to use consumptively (agricultural irrigation, domestic uses) and nonconsumptively (fishing, viewing, recreation) by Forest and other downstream users. Management activities on the Forest that affect or have the potential to affect water quality and the overall watershed resource include recreation, livestock grazing, timber management, road construction, consumptive water uses (storage, diversions), oil and gas exploration/extraction, mining, and winter sports recreation (Steamboat Springs Ski Area). In order to meet State of Colorado Water Quality Standards, the Forest protects watershed conditions through the use of best management practices as prescribed in the Water Conservation Practices handbook (FSH 2509.25), laws, and regulations.

Legal and Administrative Framework

- **The Organic Administration Act of 1897 (16 USC 475)** recognized watersheds as systems that have to be managed with care to sustain their hydrologic function.
- **The Federal Water Pollution Control Act, (Clean Water Act) (33 USC 1151, 1251, 1254, 1323, 1324, 1329, 1342, 1344)** as amended, intends to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Required are (1) compliance with State and other federal pollution control rules, (2) no degradation of instream water quality needed to support designated uses, (3) control of nonpoint source water pollution by using conservation or "best management practices", (4) federal agency leadership in controlling nonpoint pollution from managed lands, and (5) rigorous criteria for controlling discharge of pollutants into waters of the United States.

- **The Sustained Yield Forest Management Act of 1944 (16 USC 583)** and the **Multiple Use Sustained Yield Act of 1960 (16 USC 528-531)** allow for the production of multiple quality goods and services at sustained levels over time, including maintenance of water supply.

- **The Forest and Rangeland Renewable Resources Planning Act of 1974, as amended (16 USC 1601-1614).** Known as the Resource Planning Act (RPA), this act requires an assessment of present and potential productivity of the land. The act contains many references to suitability and capability of specific land areas, to maintenance of productivity of the land, and the need to protect and, where appropriate, improve the quality of the soil and water resources. The act specifies that substantial and permanent impairment of productivity must be avoided and has far-reaching implications for watershed management (including monitoring, inventories, condition and trends, and support services) on National Forests.

- **The National Forest Management Act of 1976 (16 USC 1600-1602, 1604, 1606, 1608-1614)** prevents watershed condition from being irreversibly damaged and protects streams and wetlands from detrimental impacts. Land productivity must be preserved. Fish habitat must support a minimum number of reproductive individuals and be well distributed to allow interaction between populations.

- **The Endangered Species Act of 1973 (16 USC 1531-1536, 1538-1540)** requires federal agencies to conserve threatened and endangered species and the ecosystems they depend on.

- **The Safe Drinking Water Act Amendments of 1996 (PL 104-182)** provides the states with more resources and authority to enact the Safe Drinking Water Act of 1977 (42 USC 300f). This amendment directs the states to identify source areas for public water supplies which serve at least 25 people or 15 connections at least 60 days a year.

The Corps of Engineers Wetlands Delineation Manual (Army Corps of Engineers 1987) provides the standards for determining areas of wetlands. Land areas are defined as wetlands when soil, hydrology, and vegetation all meet the technical criteria for establishment.

Executive Order 11988 directs federal agencies to provide leadership and take action on federal lands to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Agencies are required to avoid the direct or indirect support of development on floodplains whenever there are practicable alternatives and evaluate the potential effects of any proposed action on floodplains.

Executive Order 11990, as amended, requires federal agencies exercising statutory authority and leadership over federal lands to avoid to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands. Where practicable, direct or indirect support of new construction in wetlands must be avoided. Federal agencies are required to preserve and enhance the natural and

beneficial values of wetlands. Other laws pertinent to watershed management on National Forest System lands can be found in Forest Service Manual (FSM) 2501.1.

Regulations have been passed in support of these laws. The regulations require:

1. Protection of surface resources and productivity from all natural resource management activities (CFR 219).
2. Watershed analysis as part of all planning activities (CFR 219 and FSM 2500).
3. Limitations of resource use to protect watershed condition. FSM 2500 and Forest Service Handbooks (FSH) 2500 state Forest Service policy and direction regarding watershed management.

Past, current and future Forest uses all have the ability to impact watersheds and streams. The Federal Water Pollution Control Act (Clean Water Act) was enacted with the purpose of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. This act, along with other land-use laws, enables the state and federal governments to protect "waters of the United States." In addition to laws and regulations, the Forest Service adopts policy to assure that National Forests are within guidelines of laws. The regional Watershed Conservation Practices Handbook (FSH 2509.25) applies laws and regulations and provides direction to ensure that the chemical, physical, and biological integrity of watersheds is maintained. According to the WCP, streams and watersheds exhibiting the following conditions are considered to be at "potential" and can be defined as being in dynamic equilibrium:

Integrity of streamflow - Expressed as minimum flood runoff and maximum base flows. Healthy watersheds exhibit high rates of infiltration that result in minimum surface runoff. Most precipitation soaks into the soil, which tends to retard flooding, recharge ground water, maintain riparian and wetland areas, and regulate streamflow.

Integrity of the fluvial system - Expressed as stable stream networks and channels and a balance between runoff and sediment yield. In healthy watersheds, the stream network is not expanding through gully erosion, streams are neither aggrading nor degrading, channel capacity is maintained over time, and streambanks are well vegetated.

Integrity of water quality and aquatic habitat - Healthy watersheds exhibit good stream health supporting productive, diverse, and stable populations of aquatic life and displaying a natural range of habitat features such as depth of pools, composition of substrate, and sequence of pools and riffles for the aquatic organisms.

Key Indicators

- Timber acres harvested.
- Roads constructed.
- Total acres disturbed.
- Number of watersheds entered.

Resource Protection Measures

Healthy watersheds protect water quality and provide sustainable aquatic ecosystems within a dynamic equilibrium while preventing excessive, destructive flooding. This dynamic equilibrium can be changed through events such as large stand-replacing wildfires, landslides, destructive floods, and other acts of nature. These events "reset" the dynamic equilibrium, but over time watersheds may recover to a different balance of vegetative cover, surface conditions, and resulting stream flow.

Watersheds and streams can retain a healthy balance while allowing for some resource management and disturbance. Watershed potential will be protected by limiting disturbance in each watershed to levels that safeguard the integrity of streamflow, fluvial systems, water quality, and aquatic habitat. In addition to limiting the amount of disturbance within a particular watershed, the use of best management practices (BMPs) and the WCP handbook will be used to protect the integrity of watersheds. Remedial projects will be proposed, planned, and implemented to restore watershed health if watersheds are at risk or near tolerance levels.

Executive order 11988 and 11990 require federal agencies to take action to protect riparian and wetlands. The timber sale contract has provisions protecting streams and water quality, such as streamcourse protection, erosion control, operating season, and temporary roads.

Watershed Health Assessment

An inventory of major disturbances within all watersheds was completed for this plan revision. All disturbances identified have been added together to get a total acres disturbed by using a methods explained in "Clean Water Act Monitoring and Evaluation" (Ohlander 1995). A list of the Forest watersheds with the total percent disturbance is shown in Table I-2 of Appendix I.

The Forest Service recognizes that all disturbances have not been identified for this analysis. For example, nonsystem travelways exist on the Forest that are not recorded in the Geographic Information System (GIS) database. Individual stream segments where livestock have impacted streambank stability is another example of disturbance information not recorded in GIS. Because the plan revision is a large-scale, programmatic analysis, more detailed watershed analyses will be completed at the project level. These site-specific analyses will consider disturbances not covered during the forest plan revision

The inventory identified 45 of the 143 watersheds on the Forest as having a high Disturbance Risk Potential. These watersheds are listed as "Watersheds of Concern" and are summarized in Table I-3 of Appendix I. Also included in Appendix I is a map of the watersheds of concern. For information on how these watersheds affected the constraints of the FORPLAN model, see Appendix B - Forplan Constraints.

Between the publication of the Draft and Final EIS, the Forest completed a watershed condition assessment as part of a regional effort. This assessment identified stream segments considered to be high value or seriously degraded. This assessment was used to revise the condition class for some watersheds. High-value stream segments are identified in Table I-6

For this Revised Plan, levels, types, and timing of disturbance have been analyzed with soils/disturbance relationships to determine a Disturbance Risk Potential (low, moderate, high) for each prescription watershed (see Appendix I, Table I-2). These disturbance ratings are not to be confused with Class I, II, or III conditions as described in FSM

2521.1. The disturbance ratings in this analysis are used to show potential risk due to disturbance. The concept is that a watershed which has had more overall disturbance over time is at higher risk for degradation than a watershed with less overall disturbance.

In 1987, a forestwide "watersheds of concern" list was compiled from photo interpretation of orthophoto quads, from a soil/watershed computer modeling program, and from personal knowledge of existing and planned timber sales activities. This list was updated in 1994 (see Appendix I, Table I-3). The major benefit of this list has been to identify watersheds which may require special attention during project-level analyses. These watersheds are sensitive to further increases in water yield and sediment, but are not necessarily over threshold levels as determined by a watershed model. More precise modeling is part of the analysis procedure which uses the most current data on size of harvest units, date when harvested, type of harvest prescription, location within the watershed, and total road miles by surface type. Using the most current information available gives the existing conditions of the watershed at that point in time. This existing condition information is then compared with the proposed action alternatives in the environmental analysis to determine the potential effects of the proposed management activities on not only the soil and water resources, but fisheries, wildlife, and visuals resources.

Many of these watersheds with a high Disturbance Risk Potential occur within management area prescriptions where timber harvest may be proposed. These watersheds are not in conflict with these prescriptions. Watersheds on this list are identified for special attention during project analyses and may have a reduced level of harvest or none at all based on individual conditions. These watersheds are also a high priority for restoration work. Projects will focus on restoring the natural drainage pattern of a watershed by reducing the connected disturbed area. Specific projects will be identified during project level analyses. To assure that the restoration work is effective, monitoring will be conducted following project implementation.

Reference Streams - Inventory and Evaluation

Activities in a watershed can affect streams within the area. A comparison of stream health attributes between reference streams and other streams will help determine if a stream has been affected.

Reference stream comparisons can only be made within similar geoclimatic (geographic and climate) settings. Six distinct geoclimatic settings exist on the Forest (See Appendix I).

Reference streams are assumed to be healthy streams. Generally, reference areas provide an indication of natural disturbance levels within a watershed. By comparing reference to nonreference streams, a measure of stream health is provided, along with a picture of potential stream conditions. The differences between reference and nonreference streams vary with geology and local watershed conditions.

In 1994, reference streams and other streams were inventoried for a project using the pebble count technique (Schnackenberg, 1995). Within each stream reach, data for the following five attributes were collected: pebble count (over a 1,000 foot reach), Tarzwell substrate ratio, Pfankuch stability rating, amount of large woody debris, and slope of the stream.

Of the attributes listed above, Pfankuch stability rating and Tarzwell substrate ratio provided the best results in comparing reference to nonreference streams. They

respond more quickly to management and reflect the condition of other attributes to some degree.

With the Pfankuch rating, eroding banks are a factor in the total rating. With more eroding bank, there is less undercut bank, less cover in the form of overhanging vegetation, and a wider width/depth ration over time. Amount of eroding bank will show up before the width/depth ratio increases, so the eroding bank segment of the Pfankuch stability rating would show more quickly the response of management activities. Once the eroding bank heals, the width/depth ratio should start decreasing again.

Similarly, the Tarzwell substrate ratio (the percentage of fine sediment in the substrate) also shows a relationship to management. Excess sediment affects many processes in a stream. As sediment increases, pools fill in, riffles get longer, embeddedness increases, and stream gradient can change causing banks to blow out and sinuosity to decrease. Plus, identifying areas with excess sediment provides a direct link to management by locating the source.

Based on the above discussion, Pfankuck stability rating and Tarzwell substrate ratio were chosen as the attributes to compare values from reference to nonreference streams.

Depending on the stream channel types present, individual watersheds can withstand varying disturbance levels while maintaining watershed integrity. Some stream channel types are more tolerant and resistant to disturbance than others. The Forest classifies stream channel types using a classification system developed by Dave Rosgen (Catena 22(3): 169-199, 1994). Streams are classified based on stream gradient, substrate, sinuosity, width/depth ratio, and valley type. Table 3-7 is a simplified version of the classification scheme.

Table 3-7. Rosgen Stream Type Classification

Channel Classification Code	General Description
"A" type channels	-Generally steeper headwater streams -Usually located in confined valley -Very low sinuosities and width/depth ratios -Often characterized by large substrate size -Most resistant to change from disturbance
"B" type channels	-Lower gradient mid-elevation streams -Usually located in more open valleys -Moderate sinuosities and width/depth ratios -Variable substrate size -Moderately resistant to change from disturbance
"C" type channels	-Generally flat low-elevation streams -Usually located in broad valleys -High sinuosities and width/depth ratios -Smaller substrate sizes -Very susceptible to change from disturbance

Source: Catena 22(3): 169-199, 1994

Each of these stream type channels is further delineated with a numerical scheme, (1-6), with the size of the substrate varying by number. The largest substrate (bedrock) is "1" and smallest substrate (silt, clay) is "6".

By using this standardized classification system, it is possible to type streams based on characteristics and to compare those streams with reference streams. Reference streams are those in which the watershed has had no disturbance or a known amount of disturbance, or the stream channel is representative of a stream without disturbance or of a known disturbance.

When comparing streams in disturbed watersheds to reference streams in similar undisturbed watersheds, it is possible to detect effects of the disturbance on the stream channel. In addition to using reference stream comparison, the Forest also limits disturbance in individual watersheds to tolerance levels which will safeguard watershed potential from effects of land management.

Watershed Improvement Needs

Watershed improvement planning is the process of watershed problem identification, cause and effect determination, and resource coordination necessary for developing a plan to improve the watershed condition. The most effective applications for this type of planning include entire watersheds or subdrainages within watersheds. The entire watershed is preferred because it fits within the concept of ecosystem management. Supplemental Table S-2 shows the projected projects that are planned to be completed over the next decade by alternatives. The Forest is presently averaging about 180 acres a year of watershed improvement projects.

Affected Environment

Watersheds

The Forest has been delineated into 143 prescription watersheds using a standardized numbering system code developed and coordinated with other federal agencies. These watersheds range in size from approximately 1,000 acres to 20,000 acres. Watersheds are mostly 6th-level watersheds but may be 5th- or 7th-level to meet the acceptable size requirements (USDA Forest Service 1995). Table 3-8 shows the number of prescription watersheds on the Forest.

Table 3-8. Number of Prescription Watershed by River Basin

Colorado	Yampa	Platte
32	68	43

Source: GIS (DWRIS)

The existing condition of watersheds (watershed health) on the Forest varies depending upon amount of disturbance found within each watershed and the degree of natural integrity of the system. Disturbance in the form of land management activities, such as timber management, road construction, livestock grazing, recreation, and special-uses, can adversely affect a watershed's potential.

Past management activities have been concentrated in some watersheds more than others. Watersheds which have been entered more frequently have a higher risk of reduced potential due to the altering of natural functions within the watershed. Table I-2 in Appendix I shows levels of disturbance for each watershed and is used to assess watershed health risk. Activities which account for disturbance include, but are not limited to, acres of timber harvest, acres of roads, number of road/stream crossings, and

miles of roads near streams. Other factors included in the risk assessment are acres of medium or high geohazard and acres of rangeland or riparian areas in poor condition.

Surface Water

The Forest contains approximately 1,990 miles of stream channels. Of this total, 1,801 miles are perennial and contain one or more species of fish. The Forest also has 201 lakes/reservoirs, totalling 2,923 acres. Surface water on the Forest comes predominantly from snowmelt runoff, yielding approximately 1.6 million acre-feet of water per year. This equates to an average of 1.13 acre-feet per acre, which is higher than other forests in the Rocky Mountain Region. Of this amount, approximately 80% flows either directly into the Colorado River system or into tributaries to the Colorado River system. The remaining 20% flows into the North Platte River, part of the Missouri River system.

Surface water quality

Overall, water quality on the Forest is good, and all waters are designated by the state as Aquatic Life-Cold Water, High Quality Class 1 or 2, and Recreation Class 1 or 2 (Colorado Water Quality Control Commission 1994). All but two communities within the geographic area of the Forest utilize surface water for their municipal water supply. Communities utilizing surface water are Craig, Kremmling, Hayden, Oak Creek, and Steamboat Springs.

Although surface water on the Forest is good overall, there are four stream reaches which are on the State of Colorado Designated Use Impairment List (in the Colorado Nonpoint Assessment Report 1994). The impairment of these streams is not considered drastic or creating significant resource damage. The stream reaches are:

- Williams Fork River - 15.7 miles on Forest, south of Kremmling. The pollutants are metals from resource extraction and subsurface mining. There is currently a mining operation in this area outside the Forest boundary. The portion of the Williams Fork River located on the Forest is slightly impaired due to past mining activities.
- South Fork Williams Fork River - 10.1 impaired miles on Forest, south of Kremmling. The pollutant are metals from historic resource extraction and subsurface mining activities. There is no current mining activity in this drainage.
- Trout Creek - 1.4 impaired miles on Forest, southwest of Oak Creek. The pollutant are metals from resource extraction, surface and subsurface mining. There are no current mining operations on Forest, however, coal mining (surface) operations exist outside the Forest boundary.
- Elk River - 3.1 impaired miles on Forest, north of Steamboat Springs. The pollutant are metals from resource extraction and subsurface mining. There are no current mining operations on the Forest.

The Colorado Nonpoint Assessment Report is updated periodically. Stream segments may be added or removed from the impairment list as more information becomes available. Project analyses will consider the potential effects of management activities on impaired streams. Measures will be implemented, as needed, to prevent further degradation.

The entire region around the Forest has had historical surface and subsurface mining, thus the impairment due to metals could be from this era. In all cases, the water quality impairment is due to metals present in the streams. The severity rating for all listed streams is low and fisheries are present in each stream. Figure 3-6 shows locations of these stream reaches.

In addition, reaches of the Michigan and Illinois Rivers in Jackson County and the Yampa River through Steamboat Springs are on the impairment list. Although they are not on the Forest, they are within the immediate area. Impairment on the Michigan, Illinois, and Yampa Rivers are due to sedimentation, either from agriculture or urbanization, metals, and other causes.

Quality of surface water is affected by the integrity of the fluvial system and aquatic habitat. The integrity of fluvial systems on the Forest is very good overall, although some concern exists in watersheds in which past timber management has affected stream channel potential. Also, livestock grazing and recreation impacts have affected riparian condition, which in turn affects streambank stability. These effects are not widespread, and changes in management could improve existing conditions.

Management impacts on surface water

Effects to surface water due to past management activities include increased water yields over baseline conditions as a result of vegetative manipulation, roads, livestock grazing, recreation, water uses, and special uses.

The potential positive beneficial impacts from water yield increases resulting from management activities on the Forest are generally realized off-Forest primarily in the local area. The increase in water could be utilized primarily by municipalities (for domestic water supplies), irrigation districts, and hydroelectric power facilities. Downstream reservoirs which are nearby might capture this increased water to benefit recreation and fisheries. An increase in streamflow benefitting aquatic and terrestrial wildlife could also occur locally on the Forest.

Soil and water improvements are accomplished on an annual basis to correct problems caused by previous land management. Corrective measures include, but are not limited to, closing, obliterating, and revegetating roads to reduce levels of connected disturbed areas within watersheds; redesigning drainage structures on existing roads to reduce soil loss and stream sedimentation; and alleviating chronic sediment sources such as old compacted, unvegetated log landings and recreation areas.

Surface water uses

Surface water from the Forest is used both consumptively and nonconsumptively. Uses in both categories depend on high quality water.

Nonconsumptive uses of water include recreation, wildlife, fisheries, and the aesthetic quality of this resource. Value on the Forest is high for these uses. Much of the recreation use on the Forest revolves around water. Most campgrounds on the Forest are located near lakes/reservoirs and streams. In addition to camping and fishing, the Forest has Fish Creek Falls, which is a major scenic attraction near Steamboat Springs.

Consumptive uses include irrigation, drinking water, stock water developments, municipal water supplies, power generation, and transbasin water diversions. Major water users in this category include local water conservation districts and municipalities who use storage water for customers and domestic purposes, respectively. The city of Steamboat Springs currently uses two reservoirs on the Forest, Long Lake and Fish

Creek, to store its municipal water supply. The city is the holder of the special-use permits for the use and operation of the reservoirs.

The city of Steamboat Springs, in partnership with the Mount Werner Water and Sanitation District, enlarged Fish Creek Reservoir by raising the height of the existing main dam 19 feet, constructing and raising the saddle dam, and creating a new spillway channel. A final Environmental Impact Statement for the project has been completed and a record of decision issued. Construction was completed in 1996.

The Denver Water Board has an existing right-of-way in the Williams Fork area. The proposed Williams Fork Diversion Project is located in this area and could be considered for development in the future.

Potential downstream water depletion project activities are mitigated through consultation and consensus with the U.S. Fish and Wildlife Service in accordance with the Endangered Species Act for species listed in both the Platte River and Colorado River Basins.

Surface water protection measures

Public water supplies are protected by the Safe Drinking Water Act (SDWA) which was amended in 1996. The SDWA does not require source areas to deliver water of potable quality with no need for treatment. In fact, waters in pristine areas usually need treatment due to natural waterborne parasites, such as giardia. The Forest Service will work with the state to identify public supply watersheds and sources of contamination.

The WCP Handbook (FSH 2509.25) contains 17 standards and 68 design criteria to protect water quality in compliance with the Clean Water Act. The WCP standards cover all land-disturbing actions on National Forest System lands, including timber, range, engineering, recreation, and all other actions that disturb vegetation, soil, or water bodies.

If these standards are properly applied, pollutant delivery to streams and lakes will be negligible. Any waters or aquatic sites that have been degraded will recover rapidly. The physical, chemical, and biological integrity of waters in all watersheds will be as good as in watersheds that are managed exclusively for domestic and municipal supplies.

Water developments which are used off-Forest but have some facilities located on National Forest System lands are administered with special-use authorizations. They involve water storage, transmission, or diversion facilities. Stipulations may be added to the authorizing documents which ensure the quantities of water needed to fulfill the purposes of the National Forest and for environmental instream needs are identified. As special-use permits are amended, renewed, or issued, the Forest will analyze environmental effects and ascertain if mitigation or new terms and conditions are required to meet the standards and guidelines of the Forest Plan and/or the Endangered Species Act. The Forest Service has statutory responsibility for all existing permits, rights-of-way, and grants of easement located on National Forest System lands, including their administration, amendment, and renewal, when authorized and appropriate.

The 1983 Plan contains provisions to protect aquatic habitats and stream channels. The Revised Plan proposes new standards to protect perennial streams and to avoid dewatering perennial streams (USDA Forest Service 1995). Municipal water supplies receive protection under Management Area Prescription 3.23, which provides for the

management of municipal supply watersheds. The management emphasis in this prescription is to protect or improve the quality and quantity of municipal water supplies.

Groundwater

In addition to providing surface water, snowmelt runoff recharges groundwater on the Forest. Groundwater aquifers release water during periods of low precipitation to maintain base flows of streams. Groundwater is also of beneficial use off-Forest in the form of pumped irrigation and drinking water wells. Although no major aquifers occur on the Forest, groundwater coming from snowmelt off the Forest is used locally. Two communities (Yampa and Walden) within the geographic region of the Forest utilize groundwater for part or all of their municipal water supply.

Beneficial use of groundwater on the Forest is low. Uses are limited to special-use permittees and Forest Service campgrounds and administrative sites with domestic wells. The existing condition of groundwater on the Forest is good. Past management on the Forest has not had an adverse effect. Activities such as oil/gas exploration and leasing have been minimal. Other potential adverse effects from wastewater treatment and other equipment spills have been limited. Potential for groundwater contamination from recreation uses (outhouses) has not been recorded, and old pit type outhouses are being replaced by pump-vault type outhouses.

Riparian/Wetlands

Introduction

Riparian areas are those areas where lush green vegetation lives and grows on the banks of streams, lakes, and rivers. Riparian ecosystems, aquatic ecosystems, wetlands, lake-side zones, and floodplains will be jointly referred to as riparian areas. The terms riparian zones and riparian areas are used interchangeably, but by strict ecological definition, they may not be the same in all instances. See Figure 3-7 for description of riparian area.

Wetlands are those areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

Healthy riparian areas, with an abundance of trees and other vegetation, slow flood waters and reduce the likelihood of downstream flooding. Riparian areas improve water quality by filtering runoff and sediment from flood flows and adjacent upland slopes. Healthy riparian areas act like a sponge; they absorb water readily during periods of excess. Water slowed by riparian areas enters the groundwater. Some of it is released later, increasing late summer and fall streamflow. Riparian areas produce an abundance of stream cover and shade. The shade keeps water temperatures cool for fish and water-loving animals.

of riparian areas include the food, cover, and nesting habitat for birds. Many animals visit and live in riparian areas. They come for water, food, and relief from extremes in temperature. Riparian areas often provide sheltered upstream and downstream transportation connections to other habitats. Fish depend upon healthy riparian areas to provide stable channels, sustained water supply, clean and cool water, food, and shelter under overhanging banks and streambank vegetation. Riparian areas are attractive and

inviting to Forest visitors. People often seek water and riparian environments for recreation activities. A pasture system that provides scheduled use of riparian areas by livestock can produce healthier animals as well as improved riparian conditions.

There are five important elements that define the character and function of riparian zones. They include topography, vegetation, surface water, soil, and local climate. Topography often determines the space available for the development of riparian or wetland plant communities. Topography may strongly influence the occurrence and relative effect of various upslope disturbances, such as wind-thrown trees or landslides. Topography also determines the capability of the riparian zone to support many types of uses.

There is great variability in both the size and vegetative complexity of riparian zones because of the many possible combinations between stream gradient, elevation, soil, aspect, topography, water quantity and quality, type of stream bottom, and plant community. Numerous habitat niches occur within most riparian zones because of these varying conditions.

Although riparian zones occupy a small part of the overall area of the Forest, they are a critical source of diversity within the forest ecosystem. Management of riparian areas is considered in the context of the environment in which they are located, while recognizing their unique values. Preferential consideration is given to riparian-dependent resources when conflicts among land-use activities occur. Riparian-dependent resources are those resources that owe their existence to riparian areas. Examples include fisheries, stream channel stability, water quality, and wildlife.

Riparian/wetland inventory

In July 1993, a forestwide riparian/wetland inventory was completed (see Table 3-9). The inventory was conducted using photo interpretation of color infrared aerial photography at the 1:40,000 scale. The riparian zones for stream courses (perennial, intermittent, and ephemeral), wetlands located outsides stream channels, lakes, reservoirs, and ponds were identified. The riparian classification delineations were transferred optically from the aerial photos to 1:24,000 topographic quad maps. This information was digitized and used as a data base layer on the Forest's Geographic Information System (GIS). Outputs of this GIS layer can be further subdivided by 143 prescription watersheds.

Table 3-9. Acres of Riparian and Wetland by Dominant Vegetation Type

Vegetation Type	Riparian	Wetland	Total
Willow	27,495	4,180	31,675
Grass/Grasslike	6,372	4,676	11,048
Spruce/fir	9,536	318	9,854
Lodgepole pine	4,658	468	5,126
Aspen	3,493	79	3,572
Cottonwood	68	0	68
Shrubs	9	0	9
Lakes	N/A	N/A	3,796
Ponds	N/A	N/A	1,617
Total	51,631	9,721	66,765

Source: Acres from GIS (DWRIS) layers

Field data was collected during the summers of 1993 and 1994 for a report which will include a hierarchical classification system for riparian vegetation correlated with existing literature and vegetation systems. Dichotomous keys and descriptions for each vegetation type will be included, along with available management information from published literature on similar plant associations. The report will also include photographs, 1:24,000-scale topographic maps with locations of sample stands and natural riparian plant associations, and location, ecological value, and management recommendations.

This classification system will enable land managers to identify riparian plant associations and assist with adjusting management goals and strategies necessary to achieve management objectives. Sites containing highly significant riparian natural communities can be identified and may be recommended for special management status. The classification study is part of a larger effort to inventory riparian vegetation statewide, developed through cooperation of state and federal agencies and private organizations.

Four plant species found on the Forest are on The Nature Conservancy's list for unique species; two of these are on the regional sensitive species plant list. They are Ipomopsis aggregata weberi (Rabbit Ears gilia) and Cypripedium fasciculatum (Purple Lady's slipper). The other two unique species found are common in other parts of the country but rare in Colorado. They are Listera convallarioides (broad leaf twayblade) and Pyrola picta (picture leaf or white veined wintergreen). The threatened, endangered, and sensitive (TES) riparian species are discussed in more detail in the Biological Diversity TES section of this document.

Table 3-10 lists riparian plant associations on the Forest. There are a total of 28 plant associations.

Management impacts to riparian areas

Previous management activities have impacted riparian areas throughout the Forest. Water diversion projects can affect the amount and the timing of flows in a stream channel, which can change the natural riparian community. Livestock grazing of riparian vegetation can be a major source of alteration.

Recreation facilities have traditionally been developed adjacent to lakes and streams. Localized impacts to riparian vegetation is the result of this recreation use. In the wilderness, there are examples in which the shoreline riparian vegetation has been adversely affected by overuse of the public in these sensitive areas.

Logging and its related activities can also affect the extent, health and vigor of riparian vegetation. Road and trail construction adjacent to streams can physically remove the riparian vegetation, especially if roads and trails cross or run parallel to stream channels.

Historically, there were large numbers of people living in the Hahns Peak area during the gold mining boom days. Much of this mining activity was placer mining in which water was used to wash the gold out of the ore body. Upstream mining sites can introduce excessive amounts of sediment into stream channels, causing the stream bed to rise. This results in channel instability and the loss of adjacent riparian vegetation. Currently, gold mining and mining activity in general is limited on the Forest.

Another historical impact to the riparian areas occurred in the Encampment River/Hog Park area on the northern part of the Forest, along the Wyoming-Colorado border. In the early 1900s, timber in this area was harvested to provide railroad ties. The method

of moving the railroad ties to market was to stockpile them along the river banks and use the high spring flows to move them downstream. Any impediments in the channel were removed to facilitate the downstream movement of the ties. Rocks, boulders and natural log jams were removed. The overall effect on the stream channel made the channel wider and shallower. Channel instability was created as the stream responded from the removal of the natural energy dissipaters. The riparian vegetation along the banks was frequently scoured away by the downstream movement of large numbers of ties. The effects from the historic tie drives are still evident. The impacted stream systems have only partially recovered. The stream banks may have healed, but the streams lack the habitat diversity needed for good fisheries.

Table 3-10. Riparian Plant Associations on the Routt National Forest

Coniferous Dominated	Deciduous Shrub Dominated
Subalpine fir/Engelmann spruce/thinleaf alder *Abies lasiocarpa-Picea engelmannii/Alnus incana*	Thinleaf alder/horsetail *Alnus incana/Equisetum arvense*
Subalpine fir/Engelmann spruce/bush honeysuckle *Abies lasiocarpa-Picea engelmannii/Lonicera involucrata*	Thinleaf alder/Mesic forb *Alnus incana*/Mesic forb
Subalpine fir/Engelmann spruce/bluejoint reedgrass *Abies lasiocarpa-Picea engelmannii*/Mesic forb	Thinleaf alder/Mesic grasses *Alnus incana*/Mesic graminoid
Subalpine fir/Engelmann spruce/Mesic forb A*bies lasiocarpa-Picea engelmannii*/Mesic forb	Bog birch/Mesic forb-mesic grasses *Betula glandulosa*/Mesic forb-mesic graminoid
Engelmann spruce/water sedge *Picea engelmannii/Carex aquatilis*	Booth willow/Mesic forb *Salix boothii*/Mesic forb
Engelmann spruce/horsetail *Picea engelmannii/Equisetum arvense*	Barren-ground willow/Mesic forb *Salix brachycarpa*/Mesic forb
Colorado blue spruce/thinleaf alder *Picea pungens/Alnus incana*	Dummond's willow/Mesic grasses *Salix drummondiana*/Mesic graminoid
	Geyer's willow/water sedge *Salix geyeriana/Carex aquatilis*
Herbaceous Dominated	Geyer's willow/beaked sedge *Salix geyeriana/Carex utriculata*
Water sedge *Carex aquatilis*	Rocky Mtn. willow-Geyer's willow/Mesic forb *Salix monticola-Salix geyeriana*/Mesic forb
Water sedge-beaked sedge-spike rush *Carex aquatilis-Carex utriclate-Eleocharis quinqueflora*	Plainleaf willow/water sedge *Salix planifolia/Carex aquatilis*
Russet sedge-spike rush *Carex saxatilis-Eleocharis quinqueflora*	Plainleaf willow/Mesic forb *Salix planifola/*Mesic forb
Beaked sedge *Carex rostrata*	Plainleaf willow/Mesic forb-mesic grasses *Salix planifola*/Mesic forb-mesic graminoid
Tuffed hairgrass-sedge *Deschampsia cespitosa-Carex* spp.	Wolf willow/water sedge *Salix wolfii/Carex aquatilis*
	Wolf willow/Mesic forb *Salix wolfii/*Mesic forb
	Wolf willow/Mtn. strawberry S*alix wolfii/Fragaria virginiana*

Source: Kettler and McMullen, 1996

The presence of riparian vegetation on the Forest is dependent upon geomorphic processes which have occurred over time. The health and vigor of the riparian vegetation is generally stable and in good condition. The extent of the riparian areas has

not significantly decreased, although there are localized impacts to the riparian vegetation from past management activities.

Riparian and wetlands assessment

The Forest is using an approach called Proper Functioning Condition (PFC) to assess the status of riparian and wetland areas (Bureau of Land Management 1995). This field-level process evaluates the interaction of three components: vegetation, landform/soils, and hydrology. The process of assessing whether a riparian/wetland is functioning properly requires an interdisciplinary team. For riparian/wetland areas to function properly, adequate vegetation, landform, or large woody debris must be present to dissipate stream energy associated with high waterflows. Appropriate dissipation of stream energy reduces erosion, improves water quality, aids floodplain development, stabilizes streambanks, and develops the channel characteristics which provide habitat for fish production, waterfowl breeding, and other uses. The PFC process is used during project-level analysis to access the condition of riparian/wetland areas

Environmental Consequences

Direct and Indirect Effects

Surface water, groundwater, riparian, and wetlands areas are all closely related. They will be dealt with together since effects to all of them are similar. When they are impacted differently, it will be specifically noted and described.

The potential for effects to watersheds, riparian and wetlands is directly tied to activities that impact and disrupt these areas. Impacts could be from activities that physically impact the area by utilizing vegetation to disrupting surface or subsurface water flow to these area.

Effects from Timber Harvesting - Timber harvest at the full budget implementation level ranges by alternative from 663 acres of disturbance to 3,644 acres of disturbance per year, including aspen and road construction. Variations in volume, acres of harvest by prescription type, miles of roads constructed and reconstructed, acres of soil and water improvements and number of watersheds entered vary by alternative, shown in Table 3-11.

A result of timber harvesting is increases in water yield due to the removal of trees which transpire water, which increases the amount of surface water. Increases occur as increased snowmelt runoff flows, causing both the peak flow to increase in intensity and duration above baseline conditions. These increased flows can cause stream channel scour, which can lead to excess in-channel sedimentation.

In addition to an increase in available water for surface flows, ground-based logging methods used on the Forest can increase surface runoff further. Skid trails, roads and landings can compact soils, reducing infiltration and increasing connected disturbed areas within those watersheds harvested. Connected disturbed areas extend the effective stream channel system within a watershed, thus increasing surface runoff and stream sedimentation. These additional increases in streamflows can increase stream channel scour and decrease watershed condition potential further.

Increases in water and sediment yields beyond levels that a stream system can tolerate cause a stream to lose equilibrium. Pools fill, and the stream channel characteristics

change and result in a loss of aquatic habitat. Streambanks can become unstable, accelerating the problems further.

Water yield increases due to timber harvest. Alternative E would produce the largest amount of water and Alternative F the least. Alternatives A and G would produce the next highest amount of water followed by Alternatives D, C, B and F. Higher water yield increases the risk of reducing stream and watershed potential. Risk of decreased stream channel stability and watershed potential due to water yield increase is highest with implementation of Alternative E followed in order of risk by Alternatives A, G, D, C, B and F. Water yield increase is not directly correlated to the number of acres harvested or volume. Variations in silvicultural prescriptions, harvest methods, quality of project implementation, species composition, aspect and elevation and precipitation (where the harvests are proposed) affect the levels of water yield increases.

Poor road location and inadequate or excessive stream crossings can also impact the fluvial system. Surface runoff from roads directly into the stream channels increases the amount of sediment in the stream. Improper culvert size or placement also increases sediment production. These are adverse effects to the fluvial system if the amount of sediment is too high for the stream channel's capacity. Although there are instances of this condition on the Forest, they are not widespread and are not adversely affecting the fluvial system to a significant level.

Potential adverse effects as a result of road construction and reconstruction is not exclusively dependent on miles or acres of land disturbance. Using an erosional index method, which takes into account the inherent erodibility of soils, potential impacts are analyzed. At this level of planning, it is not possible to determine the location of roads within a watershed. Thus, connected disturbed area analysis associated with road construction can not be completed. Only the acres of watershed disturbance due to roads can by analyzed. Alternative E has the highest risk of adverse effects followed in order of risk by Alternatives A, G, D, C, B and F.

Similar to timber harvesting, roads potentially could have an impact to the riparian/wetlands areas. Location of the road within the riparian zone is the primary concern. Inappropriate width filter strips or improper drainage between the road and stream can produce additional sediment loading. Sidecast construction or improper road maintenance of existing roads can result in damage to riparian vegetation as well as increasing stream sediment loads. The effects of the alternatives were based on the acres of watershed disturbed. The ranking of alternatives are the same as in the above paragraph.

Spatial distribution of timber harvest is important. The number of watersheds entered and acres harvested by watershed indicate potential effects on watershed health. This analysis looks at levels of harvest within each watershed and rates risk based on this factor. If not used, effects of two alternatives with similar volumes, but one entering fewer watersheds for the ASQ, would be similar. By spreading out water yield increases over more watersheds, potential adverse effects are also spread out. Using the number of acres harvested by watershed, potential effects of implementing Alternative E and A would be of highest risk followed in order by Alternatives G, D, C, B and F.

Soil and water improvements are positive effects of timber management in this analysis. These projects reduce existing levels of connected disturbed areas, and other chronic sources of sediment in streams that affect aquatic and overall watershed health. In this analysis, projected soil and water improvements are measured in acres. Implementation

of Alternative A would result in the highest level of improvements followed in order by Alternatives E, G, D, C, F and B.

To determine potential effects of implementation of any of the alternatives on the water resource, all timber management activities; acres harvested, water yield increase due to harvest, roads constructed and reconstructed, erosion index for soils, number of watersheds entered, and soil and water improvements, must be considered. Taking all of these factors into account, implementation of Alternative A has the highest risk for potential adverse effects to the water and riparian resources followed in order by Alternatives E, G, D, C, B, and Alternative F shows the least risk of adverse effects to water and riparian resources.

Alternatives A, E and G are very similar in volume produced, acres harvested, roads constructed and reconstructed, and acres of soil and water improvements accomplished. Differences between alternatives occur with water yield increases, and number of watersheds entered. These differences allow for ranking of these alternatives.

Alternative E produces more water than Alternatives A or G. Alternative E is at a higher risk of adversely affecting water for this management practice. Alternatives A and E enter the same number of watersheds for timber harvest, and those entered under Alternative A have higher inherent soil erosional indices (Table 3-11) than Alternative E, thus Alternative A is at higher risk of impacting the water resource than Alternative E. Although Alternative G shows higher erosional index than Alternative E, the number of watersheds entered is nine more, thus potential impacts are spread out more. Acres harvested by watershed row in Table 3-11 show that more acres per watershed are harvested with Alternative E than Alternative G, thus Alternative E has a higher risk of adverse effects to water.

Table 3-11. Summary of Watershed Disturbance per Year at Full Implementation Level

Activity	A	B	C	D	E	F	G
Timber							
Harvest Volume-MMBF (including Aspen)	25	10.4	16.8	18.1	28	4.9	24.6
Acres harvested (Including Aspen)	2553	1156	1719	1783	2850	520	2497
Erosional Index (EI) (Timber)	51,932.1	25,063.4	37,389.8	37,281.4	56,270.9	10,295.2	50,778.9
Water yield Increase (ac-ft)	1,113	450	727	834	1,255	239	1,110
Roads							
Roads in Miles (Timber & Recreation)	37.4	19.6	26.4	27.1	40.4	6.3	36.4
Roads in Acres (Timber & Recreation)	80.5	39.6	55.1	56.7	87.2	14.3	78.0
Erosional Index (EI) Roads	1,454.0	667.8	946.0	978.0	1,588.0	271.7	1,404.0
Improvements							
Soil & Water Improvement (ac)	200	72	146	150	190	140	176
Totals							
Total Acres Disturbed	2635.5	1195.6	1774.1	1839.2	2937.2	534.3	2533.4
Total EI (Harvest & Roads)	53,386.1	25,731.2	35,335.8	38,259.4	57,858.9	10,566.9	52,182.9
Watersheds Entered	78	60	73	74	78	44	85
Acres per Watershed Harvested (average)	34	20	24	25	38	12	30

Source: Routt FORPLAN Model

Alternatives B, C, D and F vary in MMBF produced, acres disturbed by harvest, roads constructed and reconstructed, watersheds entered and water yield increases. These variations are easily seen and rating potential impacts of implementation of these alternatives is more evident.

There would be no direct effect of timber harvesting on riparian areas since none of the alternatives harvest timber from riparian areas.

Harvest activities outside the riparian area could potentially impact stream and riparian areas through increased water yield and sedimentation. This is especially true if the harvest activities are adjacent to the riparian area, although the effect could be realized downstream. This will be minimal due to the riparian protection provided by the above mentioned mitigation measures.

Effects from Range Management - Livestock grazing can, depending on management system and number of livestock, affect water quality. The loss of streambank protection can increase temperatures, reducing habitat for aquatic species. Also, effluent in the form of fecal coliform above State Water Quality Standards can result due to long-term overgrazing of riparian and streamside zones.

Healthy riparian zones and streambank vegetation are also important to maintaining the integrity of fluvial systems, water quality and aquatic habitat. Channel instability can be an adverse effect of long-term livestock overgrazing of the riparian zone. Effects of this can also include, with varying degrees, reduced vigor and density of riparian vegetation, and decreasing the ability of vegetation to stabilize the banks. Also, long-term grazing can result in streambank trampling, which can affect channel stability. With the loss of stable streambanks, habitat for aquatic species is diminished.

Direct effects of any of the alternatives will include utilization of plants by domestic livestock, primarily cattle and sheep. The effects on vegetation differ by type of domestic livestock, but for this analysis these differences are not considered. The effects will vary by alternative due to differences in numbers of livestock. Implementation of Alternative A will have the highest risk of adversely affecting the water resource. This alternative allows livestock grazing to continue at current levels and existing risks to water quality, stream and watershed health will continue.

Alternatives B, C, D, and F project slightly lower levels of grazing to occur than Alternative E, A, and G. In each of these alternatives, potential adverse effects to the water resources is similar to those under Alternatives E, A, and G, but slightly reduced numbers may allow for some changes in management of the individual allotments which would reduce risks of adverse effects to the stream and watershed potential, and water quality.

Implementation of Alternative F would have the fewest impacts associated with livestock grazing.

Effects from Recreation Management - The effects of recreation on the watershed and surface water resources can be similar to some effects of livestock grazing. Many camping sites, both dispersed and developed, are near lakes, reservoirs and streams. Although these are desirable locations, repeated use can reduce the health and vigor of riparian vegetation, compact soils, both of which can reduce the riparian vegetation's ability to maintain streambank stability and increase sedimentation.

Soil compaction is caused by the weight of vehicles and animals on the ground. Soil compaction impairs infiltration and plant growth. It is generally more severe on moist or clayey soils and with more traffic.

Erosion and sediment are caused by disturbing soil and concentrating runoff. Excess sediment impairs aquatic habitat. It is usually more severe when disturbances occur near streams or on unstable or highly erodible soils.

Stream bank damage is caused by foot and wheeled traffic. Overhanging banks can be crushed and large amounts of sediment added directly to streams, with resulting damage to aquatic habitat. Bank damage is more severe where animals and people concentrate along streams.

Wetland-riparian damage occurs mostly as ruts and puddles caused by foot and wheeled traffic. Surface and subsurface drainage is changed and plant growth may be impaired.

In general, these effects are minimal except at points of concentrated use. Specific problems are identified and managed at project level analysis.

Potential adverse effects due to recreation management and activities will not vary between alternatives. Overall, recreation is projected to increase on all public lands. Proper management, use of Best Management Practices and Revised Plan standards and guidelines will reduce potential impacts to the water resource.

Effects from Snowmobiles - Adverse effects from snowmobiles are generally limited to areas of concentrated use such as roads near access areas. When conditions are right, compacted snow can remain on roads and act as a barrier to spring runoff which can cause erosion. The degree of potential erosion is dependent on many site specific factors such as slope, aspect, elevation, adjacent vegetation, level of use and weather conditions. Because of this variability, and because the areas affected are generally too small and scattered to have detectable effects at the forest scale, specific problem areas will be identified and addressed during project level analysis.

The use of riparian areas by developed and especially dispersed recreation has a potential for impacts. Popular riparian areas receive a lot of use from camping, fishing and hiking. Impacts may range from vegetation reduction, soil compaction and streambank trampling from overuse. Specific problems are identified and managed during project level analyses. Solutions may range from closing the area to revegetation or hardening of the site. The effects are similar for all the alternatives.

Effects from Ski Areas - The development of the ski area has changed the hydrology on Mount Werner. Permanent clearings created for ski trails following the fall line affect hydrology differently than other management activities. In some places, stream courses have been moved and/or put into culverts to provide for lift terminals and trails, eliminating riparian vegetation and the natural drainageway. Unlike many other management activities on the Forest, additional disturbance is expected which will be more permanent. Unlike silvicultural treatments in which trees grow back and occupy the site, ski runs have been converted to grass.

The effects of Steamboat Springs Ski Area on water quality, and overall watershed potential, will not vary by alternative. Potential effects of management of this area will be a function of the master plan, annual operating plan and construction projects proposed under these plans. In most cases, area expansion or major proposals will require

separate environmental impact statements or analyses in which decisions will be tiered to the Revised Plan.

In addition to the Steamboat Springs Ski Area, the Lake Catamount Ski area is proposed for construction 7 miles south of Steamboat Springs. No ground disturbing activities will take place until all of the Lake Catamount planning documents are approved by the Forest Service and Routt County. The proposed Lake Catamount Ski Area will be treated similarly, and implementation of any of the alternatives in the Revised Plan will not affect development.

Effects from Dams and Water Diversions - Dams and water diversions can change channel dimensions, alter aquatic and riparian habitat, and obstruct fish migration in streams. When they occur, these impacts are both local (directly below the reservoir or diversion) and far reaching. When combined with the cumulative effects of the many other dams and diversions, the project contributes to downstream dewatering with adverse effects to some threatened and endangered species.

The Forest Supervisor has the authority and duty to assure that permits are consistent with the forest plan. As permits are amended, renewed, or issued, the Forest will analyze environmental effects and ascertain if mitigation or new terms and conditions are required to meet the proposed forest plan standards and guidelines. The degree of effects are currently unknown.

Beneficial use of water in the form of water diversions from existing streams will not vary by alternative. Potential adverse effects of current and future uses will exist and increase with each water rights application. These effects are common to all alternatives.

Cumulative Effects

Timber Management - Potential cumulative effects resulting from past, current and future timber management is based on the amount of timber and number of areas harvested and roads constructed. This results in increases of connected disturbed area. Reductions in connected disturbed area resulting from soil and water improvements can reduce the potential for adverse effects to watershed potential. Of all alternatives being analyzed, implementation of Alternative E has the highest risk of adverse cumulative effects to the water resource, followed by Alternatives A, G, D, C, B and F.

The use of best management practices and WCP direction should reduce potential for adverse cumulative effects. Watershed potential should not meet tolerance levels.

Range Management - Potential cumulative effects of livestock grazing include degraded riparian areas which will result in the loss of riparian vegetation, decreased channel stability, both of which affect water quality. A loss in the riparian vegetation could lead to lowering of the water table and change in riparian community. Existing grazing practices without a change in stocking levels or grazing systems could lead to adverse cumulative effects to watershed potential. Potential adverse cumulative effects of implementation of Alternatives E, A, and G would be the highest. Alternatives B, C, D, and F reduce current livestock stocking levels, and have similar risk. Alternative F has the least potential of adverse cumulative effects.

Implementation of State BMP's, Forest Plan standards and guidelines, and WCP practices will improve existing watershed conditions and will enable the Routt National Forest to meet State Water Quality Standards, thus be in compliance with Section 319 of the Clean Water Act.

Recreation - With increases in recreation users forestwide, potential impacts to streams, riparian vegetation and overall watershed potential could increase. With the implementation of the WCP, improved environmental awareness, and continuing efforts to improve existing recreational facilities on the Forest, cumulative effects to watershed potential should be reduced. Potential cumulative effects of recreation will not vary by alternative.

Riparian settings receive protection under all alternatives through the application of the forest-wide standards and the WCP handbook. The possibilities for damage to the riparian system is greater in those alternatives with more activities such as road building and timber harvesting. Nevertheless, identification of riparian areas during project planning and monitoring should prevent any widespread and long-term deterioration of riparian resources.

Ski Areas - Potential cumulative effects of ski areas on watershed potential will not vary by alternative. The existing Steamboat Springs Ski Area and proposed Lake Catamount Ski Area, do and, will affect the watershed resource with implementation. Stream channels and riparian vegetation are altered permanently with these operations. Management in these situations emphasizes use of and monitoring of best management practices to achieve state standards.

Diversions - Potential cumulative effects as a result of water put to beneficial use through diversions of surface water will depend on future water rights applicants. More applications for water diversions will strain existing stream systems further and potentially dewater streams entirely. This will affect the hydrologic function of watersheds, and would violate laws that the Forest must follow. The continuation, expansion and monitoring of the In-stream Flow (ISF) program should prevent this from happening.

Biological Elements

- Biological Diversity
- Fire
- Fisheries and Aquatic Habitat
- Insect and Diseases
- Vegetation
- Wildlife

Biological Diversity

Introduction

Biological diversity refers to "the full variety of life in an area, including the ecosystem, plant and animal communities, species and genes, and the processes through which individual organisms interact with one another and with the environment" (USDA Forest Service 1992). Conservation of biological diversity has become a concern of many. The Forest Service is charged with providing for the diversity of plant and animal species (36 CFR 219.26). The Routt National Forest has adopted a three-part approach to the conservation of biological diversity in support of revising the 1983 Plan. The coarse filter, fine filter and range of natural variability are summarized in this document. The coarse filter focuses on the function, composition, and structure of ecosystems as a whole. Providing for these parts of the ecosystem as a whole should be adequate to provide for the needs of most species. However, a few species may require special attention due to unique habitat requirements or rarity of species numbers in an area. These sensitive species needs will be addressed in the fine filter portion of the assessment. The range of natural variability provides a context for assessing current and projected Forest conditions.

Coarse Filter Summary

Any assessment of biological diversity must be placed in the context of scale, both spatial and temporal. The temporal scale issue is addressed by the range of natural variability. For the coarse filter assessment, the spatial scale question will be addressed using a hierarchical structure of landscapes. Specifically, the coarse filter analysis is based on the National Hierarchy of Ecological Units (ECOMAP 1993). This approach consists of a series of levels in which lower levels are grouped into higher levels based on similar characteristics. The actual ecological units and their map unit design criteria are displayed in Table 3-12. Each level is described in more detail in the Biological Diversity Report (Appendix D).

Because of the programmatic decisions made in the Revised Plan and the size of the Forest, the coarse filter assessment was focused at the province and section levels. The Forest resides within the Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province (M331) (Bailey 1994), as displayed in Figure 3-8. There are nine sections within this province. The Forest is inside two of these; M331H-North-central Highlands and Rocky Mountain and M331I-Northern Parks and Ranges (Figure 3-9). These two sections were analyzed together. Detailed descriptions of this province and both sections are found in Appendix D. Summary information on cover types, the main focus of this coarse filter analysis, is presented here.

Province - Cover Types

The Forest Service mapped the forested land in the United States as a part of the Resources Planning Act (RPA) 1992 assessment update (Powell et al. 1993). Table 3-13 displays this information summarized for the Province M331.

Much of the province is nonforested. The major forested cover type is lodgepole pine. Spruce/fir and pinyon/juniper are also important cover types in terms of the acreage they cover. Forested cover types comprise roughly 65% of the land area. Federal, state, and private timber management occurs on an estimated 6.1 million acres which is approximately 22% of the forested area and 9% of the total area in the province.

Table 3-12. Principal Map Unit Design Criteria of Ecological Units	
Ecological Unit	**Principal Map Unit Design Criteria***
Domain	Broad climatic zones or groups (e.g. dry, humid, tropical)
Division	Regional climatic types (*Trewartha 1968*) Vegetational affinities (e.g. prairie or forest) Soil order
Province	Dominant potential natural vegetation (*Kuchler 1964)* Highland or mountains with complex vertical climate-vegetation-soil zonation
Section	Geomorphic province, geologic age, stratigraphy, lithology Regional climatic data Phases or soil orders, suborders, or great groups Potential natural vegetation Potential natural communities (PNC)**
Subsection	Geomorphic process, surficial geology, lithology Phases of soil orders, suborders, or great groups Subregional climatic data PNC-formation or series`
Landtype Association	Geomorphic process, geologic formation, surficial geology and elevation Phases of soil subgroups, families or series Local climate PNC-series, subseries, plant associations
Landtype	Landform and topography (elevation, aspect, slope gradient, and position) Rock type, geomorphic process Phases of soil subgroups, families, or series PNC-plant associations
Landtype Phase	Phases of soil families or series Landform and slope position PNC-plant associations or phases

*The criteria listed are broad categories of environmental and landscape components. The actual classes of components chosen for designing map units depend on the objectives for the map.

**Potential Natural Community-Vegetation that would develop if all successional sequences were completed under present site conditions.

Source: National Hierarchy of Ecological Units (ECOMAP 1993)

Table 3-13. Cover Types, Acres and Percent of Total - Province M331		
Cover Type	**Acres**	**Percent of Total**
Douglas-fir	3,702,200	5.6
Ponderosa pine	5,269,300	8.0
Lodgepole pine	9,781,700	14.9
Spruce/fir	8,776,500	13.3
Oak brush (chaparral)	1,601,700	2.4
Pinyon/juniper	8,115,900	12.3
Hardwoods (predominately aspen)	5,045,400	7.7
Nonforested	23,316,900	35.4
Water	241,600	.4
Total	**65,851,200**	**100.0**

Source: (Powell et al. 1993)

Section - Cover Types

Using the vegetation/land cover data (based on LANDSAT satellite data) from the Colorado Gap Analysis Project and the Wyoming Gap Analysis Project (Wyoming GAP Analysis 1996), information was summarized for the two-section area. This information is presented in Table 3-14.

As the data shows, about two-thirds of the two-section area is forested. Lodgepole pine covers the greatest percentage of the area. Spruce/fir, aspen, and ponderosa pine also cover a large percentage of the total acreage. Of special note, 63% of the oak brush and 46% of the aspen in the province is found within these two sections. Accordingly, areas covered by oak brush and aspen within the sections are very important in their contribution towards this cover type at the province level.

Table 3-14. Cover Types, Acres and Percent of Total for Sections M331H and M331I

Cover Type	Acres	Percent of Total	Cover Type % in Province Represented in Section
Douglas-fir	482,000	2.5%	13.0%
Ponderosa pine	1,927,100	10.0%	36.6%
Lodgepole pine	2,980,000	15.4%	30.5%
Spruce/fir	2,583,000	13.4%	29.4%
Oak brush (chaparral)	995,800	5.1%	62.6%
Pinyon/juniper	1,137,900	5.9%	14.0%
Hardwoods (predominately aspen)	2,311,700	11.9%	45.8%
Nonforested	6,888,500	35.6%	29.5%
Water	41,700	.2%	17.3%
Total	**19,347,700**	**100.0%**	**29.4%**

Source: GIS (ARC/Info), Colorado and Wyoming GAP landcover layers and National Hierarchy of Ecological Units layer

The specific contribution of cover types found on the Forest towards the two sections are shown in Table 3-15. The Forest represents about 7% of the area in the two sections. Although oak brush is very important at the section level, inventoried Gambel oak on the Forest is only about 0.2% of the two-section total. However, some of the other unclassified shrub areas on the Forest (grouped in with nonvegetated) may be Gambel oak. The largest percentage contribution made by the Forest for the two sections is spruce/fir at 18%. Based on these figures, the Forest does not contribute any disproportionately large percentages to any of the cover types analyzed. However, because oak brush and aspen in the two sections constitutes such a large portion at the province level, the oak brush and aspen managed by the Forest may be more important than the .2% and 11% contribution indicate.

Much of the discussion in the Vegetation Section is also part of this coarse filter analysis. The projected effects to the vegetation resource are disclosed in that section. Each of the forested cover types and habitat structural stages discussed in that section (Table 3-32 and 3-34) are expected to continue on the Forest for both the long and short term.

Table 3-15. Routt National Forest Cover Types in Sections M331H and M331I			
Cover Type	**Acres**	**Percent of Forest Total**	**Percent of Cover Type in Sections**
Spruce/fir	453,977	33.4	18.0
Lodgepole pine	379,097	27.9	13.0
Aspen	260,364	19.2	11.0
Oak brush (Chaparral)	1,793	.1	.2
Douglas-fir	5,336	0.4	1.0
Nonforested	256,204	19.0	4.0

Source: GIS (ARC/Info), vegetation layer and National Hierarchy of Ecological Units layer

Range of Natural Variability Summary

This section briefly highlights some of the major segments of the Routt National Forest Range of Natural Variability Report (Routt National Forest 1994). A complete summary of this document is found in the Routt National Forest Biodiversity Report, Appendix D.

Determining the range of natural variability at the forest-wide scale is not a statistically rigorous process. It also should not be viewed as a management goal in and of itself. The range of natural variability does serve to place conditions and management actions in a temporal context. It also helps illustrate ecosystem dynamics and processes (especially disturbance processes) and, to some degree, provides information on the conditions which can be maintained (Morgan et al. 1994).

The temporal scale, or period of time that the RNV report focuses on is mid-1800s to present. The mid-1800s was the period of European exploration and settlement in northwestern Colorado. Some of the natural resources in the area were documented for the first time.

The RNV report focused on the following seven parameters:

- Forest Communities - composition (tree species/types), structure (age classes), and patterns.
- Insects and Diseases - composition (primary insects and disease) and their effect on the major forest types, their change in structure (age classes) and pattern. Insects and disease disturbance intervals.
- Fire Regimes - fire frequency and fire size in the different vegetative communities (composition).
- Nonforest Communities - shrub and grassland composition and structure.
- Human Use and Occupation - population composition, population changes (structure) over time, and human-induced changes on the environment.
- Wildlife and Fish - composition (species of wildlife and fish) and population estimates (structure).
- Riparian Environments - plant composition and structure; processes altering riparian environments.

This section will focus on three of the seven parameters investigated in the main report. These three parameters include forest communities, nonforest communities, and fire

regimes. Although the other four parameters are not addressed in this RNV summary, effects on these resource areas from the alternatives are discussed in individual sections of this document.

The Setting

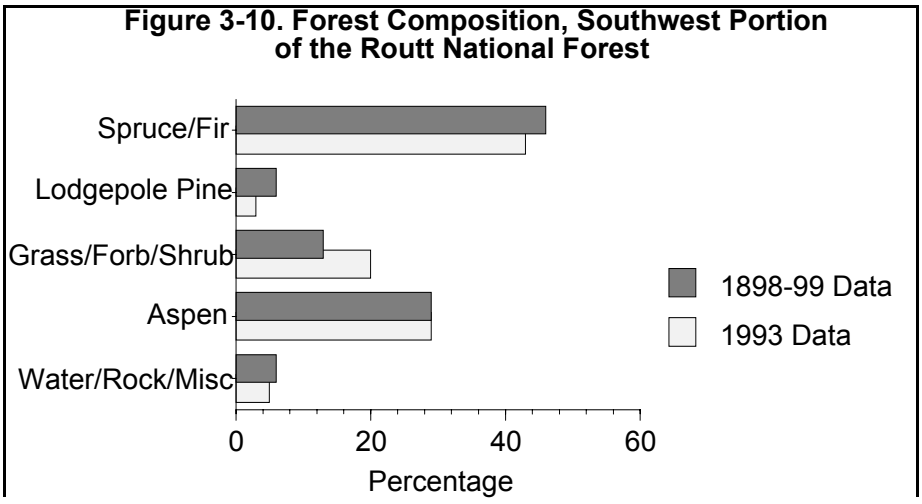
Topography of the Forest is typical of glaciated mountain regions. Elevation ranges from about 7,000 feet in the valleys to over 13,000 feet on the highest peaks. The area is characterized by steep glaciated mountains with barren, knife-edged ridges and peaks. Valleys are steep and U-shaped. Other parts have been glaciated by broad sheets of ice that did not follow drainages. These areas are made up of rolling terrain with deep valleys cut by streams. They have many rock outcrops and exhibit other features of glaciation.

The climate on the Forest can be summarized briefly by the statement "long, snowy winters and short, cool summers." Most of the precipitation comes as snow, although some years have wet summers. Summer thundershowers are common, although their extent is localized. The south end of the Gore Range, the west end of the Elkhead Mountains, and the north, south and east fringes of North Park are the driest portions of the Forest. The country between the Continental Divide and California Park is the wettest.

Forested Communities

There has been little change in the forest community composition over the last 2,000 years, based on forest community composition pollen stratigraphy performed for an area in the southwest part of the Forest by R. Scott Anderson, Ph.D. (Northern Arizona University). A comparison of current data and historic records also indicate a fairly stable composition. The most specific data on the composition of the forested communities during the late 1800s was collected during 1898-99 by George Sudworth. This data was collected on the White River Plateau Timber Land Reserve part of which is now on the Yampa Ranger District of the Routt National Forest (the southwest part of the Forest). This 1898 forest communities map had information on timber type and size. It was digitized and input into GIS to allow comparison with present timber type and size. While this is not the entire area occupied by the current Forest, it was the best quantitative information available. The following conclusions are based on this comparison and shown in Figure 3-10.

Figure 3-10. Forest Composition, Southwest Portion of the Routt National Forest



Source: Routt National Forest RNV Report 1994

Table 3-16 displays a range of composition for the major forest types based on the Sudworth report and other historical accounts since the Forest Reserves were created. The current percentage of cover types is also displayed in Table 3-16. The historical estimates are from various sources covering varying sections of the Forest. They should not be viewed as exact figures and are best used in the general sense. For example, although Engelmann spruce/subalpine fir is slightly higher and lodgepole pine is slightly lower, the historic composition estimates are approximately the same.

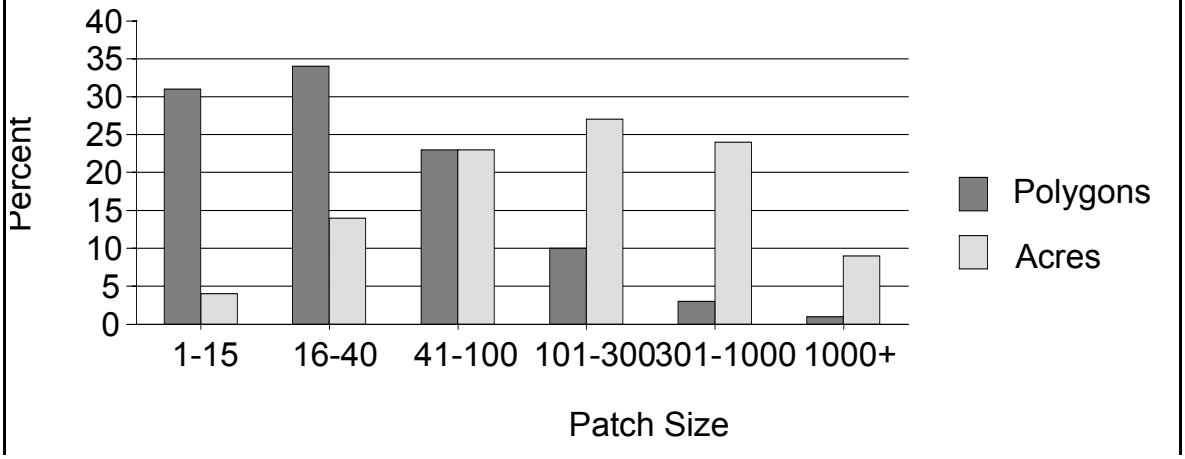
Table 3-16. Composition by Forest Cover Type

Cover Type	Percent of Historic Composition Based On:		Percent of Current Composition Based on:	
	Forested Acres	Total Acres	Forested Acres	Total Acres
Spruce/fir	30-40%		41%	
Lodgepole pine	35-45%		35%	
Aspen	20-25%		24%	
Grassland		8-10%		9%
Shrubland		2-4%		5%
Douglas-fir	<1%		<1%	

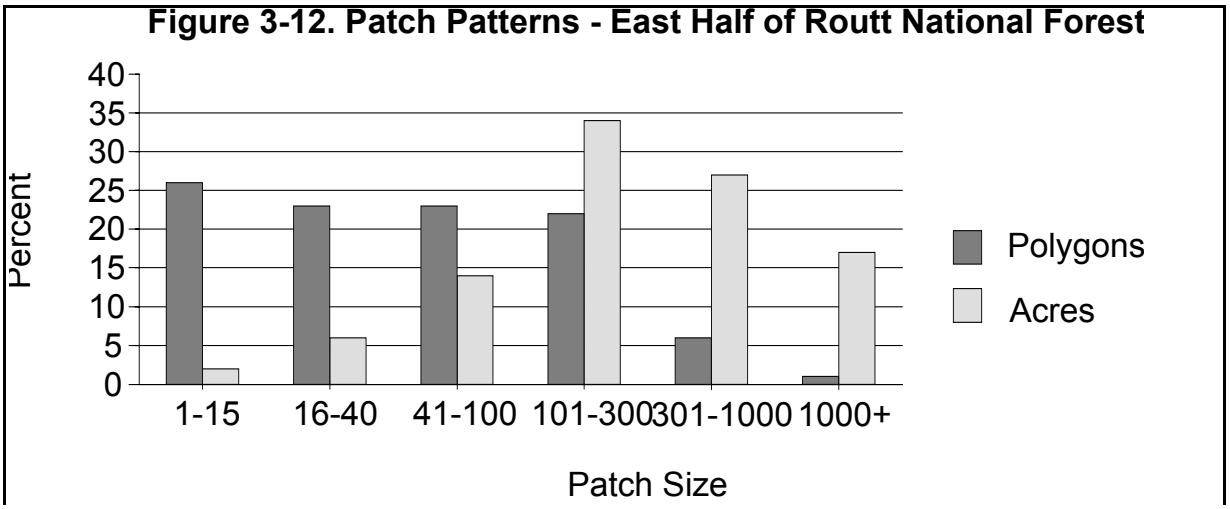
Source: Routt RNV 1994 and GIS (DWRIS), vegetation layer

Forest Community Patch Patterns - An exercise was conducted in an attempt to determine the natural pattern for forest communities. Several roadless areas were analyzed for patch size. These roadless areas are believed to be the Forest's best examples of landscapes unchanged by management, based on available data. There was no historic patch data available to evaluate patch and pattern size, thus, no comparison can be made. The Forest was divided into a west and an east half. Figure 3-11 illustrates patterns for the west half of the Forest; Figure 3-12 illustrates patterns for the east half. These two graphs are representative of the relationships between patch size and acreage for each community type analyzed. In both of these graphs there are a greater number of small-sized patches, but most of the acreage is in the larger patch sizes. It only takes one very large polygon of 1,000+ acres to equal numerous small polygons of 1-15 acres.

Figure 3-11. Patch Patterns - West Half of Routt National Forest



Source: Routt RNV 1994 and GIS (DWRIS) vegetation layer



Source: Routt RNV 1994 and GIS (DWRIS) vegetation layer

Forest structure was also analyzed using this same roadless area data. Habitat structural stage and forest structure are described in the FEIS Vegetation section. Table 3-17 compares the current structural stage percentages by cover type with percentages of structural stages from 14 roadless areas. These areas offer some insight into the range of natural variation associated with structural stage. However, they should not be treated as defining strict RNV parameters. Given the infrequent and catastrophic disturbance regime associated with fire on the Routt, this technique has limited application in defining strict RNV limits (Morgan et al. 1994). For example, the 1988 fires in Yellowstone National Park represent an infrequent catastrophic fire event. Measurements made before those fires would yield different results than measurements made after the fires (Romme and Despain 1989, Romme 1982). The differences shown in Table 3-17 may be due to different management actions in the overall forest compared to the roadless areas. Most of the figures for the roadless areas and the forested land totals are similar. Exceptions are pole size for both aspen and spruce/fir, mature for all three cover types, and the seedling/sapling for lodgepole pine.

Table 3-17. Structural Stage Percentages by Cover Type in Selected Roadless Areas and on Forested Lands

	Aspen		Lodgepole Pine		Spruce/Fir	
Structural Stage	**Roadless**	**Forest**	**Roadless**	**Forest**	**Roadless**	**Forest**
1 - Grass/forb	2.2%	1.7%	0.4%	1.5%	0.8%	1.0%
2 - Seedling/sapling	1.7%	2.0%	2.2%	4.1%	2.2%	1.4%
3 - Pole	36.1%	48.2%	31.1%	36.6%	18.1%	27.1%
4 - Mature	60.0%	48.2%	66.2%	57.8%	78.9%	70.5%

Source: Routt RNV 1994 and GIS (DWRIS) vegetation layer

Fine Filter Summary - Threatened, Endangered, and Sensitive Species

Introduction

A few species may require special attention due to unique habitat requirements or rarity of species numbers in an area. These species needs will be addressed in the fine filter portion of the biological diversity assessment. This section is a summary of the fine filter assessment. The fine filter assessment itself is composed of two parts: the Biological Assessment (BA) disclosing effects to threatened or endangered species and the Biological Evaluation (BE) disclosing effects to Forest Service sensitive species. These two sections, along with documentation of correspondence related to the BA, are found in Appendix J to this FEIS.

Protection measures will be designed to provide habitat capability for those species addressed with the fine filter. This will prevent these sensitive species from trending toward listing as threatened or endangered as a result of proposed management activities on the Forest. Addressing those species that are considered to be globally, regionally, or locally rare provides the most effective way to disclose direct, indirect, and cumulative effects on biological diversity within the planning area.

Implementation of any of the proposed alternatives would result in biological diversity that would continue to be shaped and influenced primarily by the existing condition of the Forest's vegetative habitats and, to a lesser degree, by the human values and demands placed on them. An important planning issue or concern is the maintenance or nonmaintenance of species diversity and viability. The National Forest Management Act (NFMA) states that forests shall "provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area" (36 CFR 219.26).

To address population viability, 36 CFR 219.19 states: "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." The determination that adequate habitat would or would not be available to support viable populations is made at the forest plan level. Forest managers must assure that a diversity of habitats are distributed across the entire Forest, including unique habitats that are critical for species determined to be at risk.

Summary of Biological Assessment

Legal and Administrative Framework

Threatened and Endangered Species

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service under authority of the Endangered Species Act of 1973, as amended. An endangered species is defined as one which is "in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as one "that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range . . ." [FSM 2670.5 (81) and FSM 2670.5 (211), respectively]. A proposed species is defined as one for which "information now in possession of the FWS indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threats are not currently available to support proposed rules" (FSM 2670.5).

Fifteen federally listed endangered species were analyzed during the Revised Plan process:

- Black-footed ferret (*Mustela nigripes*)
- Peregrine falcon (*Falco peregrinus anatum*)

- Bald eagle (*Halieetus leucocephalus*)
- Whooping crane (*Grus americana*)
- Colorado squawfish (*Ptychocheilus lucius*)
- Humpback chub (*Gila cypha*)
- Bonytail chub (*Gila elegans*)
- Razorback sucker (*Xyrauchen texanus*)
- Piping plover (*Charadrius melodus*)
- Least tern (*Sterna antillarum*)
- Pallid sturgeon (*Scaphirhynchus albus*)
- Eskimo curlew (*Numenius borealis*)
- American burying beetle (*Nicrophorus americanus*)
- Ute ladies'-tresses orchid (*Spiranthes diluvialus*)
- Western prairie fringed orchid (*Platanthera praeclara*)

There is considerable national and regional interest in gray wolf re-introduction over much of their historical range in the west, including portions of Colorado. However, the gray wolf was not one of the listed species requiring evaluation by the U.S. Fish and Wildlife Service during this forest plan revision; therefore, it was not included in the Biological Assessment. No evaluations or decisions on wolf re-introduction will be included in this plan revision because this issue is beyond the scope of any single forest plan and outside the authority of the Forest Service.

However, since wolf re-introductions are, or may become, part of the broader issue of biological diversity, it is appropriate to address how the proposed alternatives would effect potential wolf recovery habitat on the Routt National Forest. This potential habitat was evaluated and rated by the U.S. Fish and Wildlife Service in a wolf recovery feasibility study (Bennett 1994).

Determination of Effects on Listed Species

This biological assessment arrives at the determination that none of the alternatives evaluated in the revision of the Routt National Forest Land and Resource Management Plan are likely to adversely affect any listed species or critical habitat designated by the Secretary of Interior. No proposed species or proposed critical habitat has been identified by the U.S. Fish and Wildlife Service as being associated with this federal action.

This determination has basis in a thorough evaluation of all land allocations or levels of management activities prescribed or permitted in any of the alternative. The rational for this determination is based primarily on two considerations:

- The minimal potential for direct, indirect, or cumulative effects to listed species or their habitat requirements within the planning area (Routt National Forest) or larger U.S. Fish and Wildlife Service definitional "Action Area" (50 CFR 402.2) ... resulting from actions permitted in the alternatives.

- The quantity and specificity of mitigation measures and cooperation and coordination requirements that would be implemented under all of the alternative. Section 7, Endangered Species Act, consultations will be utilized as appropriate on a project-by-project basis, subsequent to the selection and implementation of a chosen alternative for the Forest Plan revision.

Determination of Effects on Gray Wolf Recovery Habitat

Because of the low predicted changes (between 1% and 15% over the 50 year planning period) to the composition, structure, function, and effectiveness of Forest wildlife habitat complexes following implementation of any of the proposed alternatives, it is unlikely that wolf re-introduction potential would be improved or reduced from the current rating as a result of this forest plan revision (see sensitive species and wildlife sections in Chapter 3).

Other considerations such as domestic livestock numbers, big game numbers, and recreation use densities are not predicted to change over current conditions to the extent that wolf recovery potential would be altered, either positively or negatively (see range, wildlife, and recreation sections).

Consequently, it is the determination of this Biological Assessment that none of the proposed alternatives would jeopardize or preclude the option for future re-introduction of wolves on the Routt National Forest.

Summary of Biological Evaluation

Legal and Administrative Framework

Sensitive Species

Sensitive species are those plant and animal species designated by the Regional Forester whose population viability is a concern on National Forests within the region. Sensitive species may also be those species whose current populations and/or associated habitats are reduced or restricted, those with habitats and/or populations are considered vulnerable to various management activities, and those requiring special emphasis to ensure that they do not move towards listing as threatened or endangered.

Identification and designation of sensitive species and emphasis on the management of sensitive species habitat are Forest Service policy and not directly related to federally designated threatened and endangered species under the Endangered Species Act and administered by the U.S. Fish and Wildlife Service.

Laws, regulations, and Forest Service policy pertaining directly and indirectly to sensitive species are as follows:

- **36 CFR 219.26**. Forest planning shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area. Such diversity shall be considered throughout the planning process. Inventories shall include quantitative data, making possible the evaluation of diversity in terms of its prior and present condition. For each planning alternative, the interdisciplinary team shall consider how diversity will be affected by various mixes of resource outputs and uses, including proposed management practices.
- **FSM 2672.11**. Regional Foresters shall identify sensitive species occurring within the region. They shall examine the following sources as possible candidates for listing as sensitive species:
    - U.S. Fish and Wildlife Service or National Marine Fisheries Service candidates for federal listing under Federal Notice of Review.
    - State lists of endangered, threatened, rare, endemic, unique, or vanishing species, especially those listed as threatened under state law.
    - Other sources as appropriate in order to focus conservation management strategies and to avert the need for federal or state listing as a result of National Forest management activities.
- **FSM Directive No. 2600-94-2**. This directive designated sensitive species for The Rocky Mountain Region, USDA Forest Service (Region 2) and provided regional direction for implementation of agency regulations set forth in the Forest Service Manual (FSM 2670).

- The 1992 Rocky Mountain Regional Guide provides some planning objectives for sensitive plants.
    - Provide for variety of life through management of ecosystems.
    - Protect, conserve and improve habitat for threatened, endangered and sensitive species.

Routt National Forest Sensitive Species

Sensitive species known to occur, suspected to occur, or having occurred on the Forest were refined from the Regional Forester's list based on information obtained from the Colorado Division of Wildlife, Colorado Natural Heritage Program, local Forest Service, and others. A complete species list, including other species of concern, appears in the Biological Diversity Report prepared in conjunction with the Revised Plan.

Table 3-19 is a listing of Region 2 sensitive animal species known or suspected to occur on or within the vicinity of the Forest. Table 3-20 displays sensitive plant species. These lists also include species likely extirpated from the Forest, but with documented historical occurrences. The species are distributed by habitat complexes they prefer to use. The habitat complexes are described in the vegetation section. If the species does not easily fit within one or more complexes, the unique habitat they are associated with is included, i.e., caves and mine shafts for bats. Refer to the wildlife section for a discussion of the habitat complexes and how they compare to the historical range of natural variation for the Forest. Species use of the habitat complexes are from Finch 1992 and Hoover and Wills 1984.

Table 3-19. Distribution of Routt National Forest Sensitive Animal Species by Habitat Complex*

Mammals	1	2	3	4	5	6	7	Notes
Spotted bat							X	caves/mines
Lynx (C(W))	X		X					
Ringtail				X				
Pygmy shrew	X		X		X			
Townsend's big-eared bat							X	caves/mines
Marten	X	X	X					
Fringe-tailed myotis							X	*caves/mines
Dwarf shrew		X	X				X	Alpine/Talus
Wolverine	X		X					
Birds								
Northern goshawk	X	X	X	X				
Greater sandhill crane					X			
Olive-sided flycatcher	X	X	X		X			
Columbian sharp-tailed grouse				X				
Ferruginous hawk						X		
White-faced ibis					X			
Merlin		X			X			
Osprey							X	open water
Flammulated owl			X					
Loggerhead shrike						X		
Fox sparrow					X			

Black swift							X	cliffs/waterfalls
Black-backed woodpecker	X							
Three-toed woodpecker	X	X	X					
Golden-crowned kinglet	X							
Purple martin		X						
Pygmy nuthatch		X			X			
Boreal owl	X							
Back tern					X			
Lewis' woodpecker					X	X		
Long-billed curlew					X			
Reptiles/Amphibians								
Northern leopard frog					X			
Wood frog					X			
Tiger salamander					X			
Boreal western toad (C(W))					X			
Fish								
CO. River cutthroat trout							X	open water
Invertebrates								
Rocky Mountain capshell snail					X		X	open water
Cockerell's striate disc snail					X		X	

*Habitat Complexes: 1 Mature Conifer; 2 Aspen; 3 Lodgepole Pine; 4 Shrub; 5 Riparian/Wetland; 6 Grass/Forb; 7 Specialized

C(W) = USFWS Candidate Species, warranted but precluded

The habitat complexes include only the appropriate habitat structural stages. For example, for late successional spruce/fir, only the later structural stages 4b, 4c, and 5 were considered as potential old growth. All structural stages, except the seedling sapling stage (i.e. SS1) were evaluated for lodgepole pine. For the aspen community, all structural stages 3 and 4 were considered. (See vegetation section of this chapter for discussion of vegetative habitat structural stages.)

Sensitive plant species are listed under the habitat complex they are most often associated with. Since sensitive plant species are often restricted to small microsites and are very limited in their distribution, estimates of potential habitat are not appropriate and therefore not displayed.

Table 3-20. Distribution of Routt National Forest Sensitive Plant Species by Habitat Complex*									
Plants	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Notes**	**Documented on Forest**
Harrington beardtongue (*Penstemon harringtonii*)				X		X		Pinyon/juniper and sagebrush slopes	
Purple lady's slipper (*Cypridedium fasciculatum*)	X		X			X		Openings or dense stands	X
Rabbit ears gilia (*Ipomopsis aggregata spp.weberi*)						X	X	Openings in forest	X
Hanging garden sullivantia (*Sullivantia hapemanii var. purpusii*)					X			Cool moist cliffs	
Roundleaf sundew (*Drosera rotundifolia*)					X				X
Livid sedge (*Carex livida*)					X				X
Colorado tansy-aster (*Machaeranthera coloradoensis*)									

*Habitat Complexes: 1 Mature Conifer; 2 Aspen; 3 Lodgepole Pine; 4 Shrub; 5 Riparian/Wetland; 6 Grass/Forb; 7 Specialized

Sensitive species that are also candidate species for listing as threatened or endangered by the U.S. Fish and Wildlife Service are followed by the designation C. The U.S. Fish and Wildlife Service issued a Notice of Review in the February 28 Federal Register for plant and animal species that are "Candidates" for listing as endangered or threatened under the Endangered Species Act. The revised candidate list replaces an old system that listed many more species under three categories: Category 1 (C1); Category 2 (C2); and Category 3 (C3).

Key Indicators:

- Changes in composition, structure, function, pattern, and distribution of forest habitats.
- Predicted effects on listed and sensitive species habitat adjacent to the Forest or on down-stream river systems.
- Proposed protection, consultation and coordination measures.
- Species viability.

Resource Protection Measures

Laws, policy, forest-wide direction, and standards and guidelines that maintain or enhance habitats for threatened, endangered, or sensitive species applies to all alternatives. A summary of this direction and standards and guidelines follows:

Sensitive species

Implement national and regional Forest Service policy and direction for the identification and management of sensitive species (FSM 2670).

The following are protection and mitigation measures specific to the Revised Plan that address sensitive species or assemblages (similar groups) of sensitive species under all of the proposed alternatives.

Forest-wide direction:

Goals and Objectives

1. Maintain or create habitats suitable for a stable or increasing population of federally listed threatened and endangered species, and Forest Service sensitive species for the Routt National Forest including the Colorado River cutthroat trout.

Forest Wide Standards and Guidelines (FWS&G)

Administrative (Revised Plan, p. 1-22)

1. In land adjustment activities, give priority to acquiring lands that contain habitat identified by U.S. Fish and Wildlife Service as necessary for the recovery of federally listed threatened and endangered species.

   In land adjustment activities including land exchange, purchase, disposal, and donation, consider the following:

   Consider the effect of land adjustments on sensitive species habitat. Avoid land adjustments which could result in a trend toward federal listing, or loss of population viability for any sensitive species. Sensitive species habitat can be conveyed if conveyance would not result in a trend toward federal listing, adverse impacts to the population viability of the species, or if effects could be mitigated.

   Acquire lands that contain resource values identified during scoping as important in contributing toward National Forest System resource management goals and objectives as stated in the Revised Plan. Examples include: wetlands, riparian areas, essential wildlife habitat, threatened of endangered species habitat, sensitive species habitat, significant cultural resources, timber lands, rangelands, or other areas.

Biological Diversity (Revised Plan, p. 1-8)

1. Develop prescriptions prior to timber harvest to identify the amount, size(s) and distribution of down logs and snags to be left on-site, as well as live, green replacement trees for future snags. On forest sites, retain snags and coarse woody debris (where materials are available) in accordance with the average minimums specified in Table 1-1.
2. Retain all soft (rotten) snags unless they are a safety hazard.

Range (Revised Plan, p. 1-9)

1. Phase out season-long grazing systems that allow for livestock grazing use in an individual unit during the entire vegetative growth period, except where determined to achieve or maintain the desired plant community.

Threatened, Endangered, Sensitive Species and Wildlife (Revised Plan p. 1-14)

1. Manage human disturbance at caves and abandoned mines where bat populations exist. When closing mines or caves for safety or protection reasons, reduce disturbance to residing bat populations and provide bat access.

2. In areas where tall dense cover is desired for ground-nesting birds, retain adequate residual cover from previous growing seasons since some species begin nesting in April and May before spring growth.
3. Some bird species prefer to nest in undisturbed cover. In areas where these species are a primary consideration, manage livestock grazing to avoid adverse impacts to nesting habitat.
4. Protect all active and inactive raptor nest areas. Extent of the protection will be based on proposed management activities, human activities existing before nest establishment, species, topography, vegetative cover and other factors. A no-disturbance buffer around active nest sites will be required from nest-site selection to fledging (generally March through July). Exceptions may occur when animals are adapted to human activity.
5. Where newly discovered threatened, endangered, proposed or sensitive species habitat is identified, conduct an analysis to determine if any adjustments in the forest plan are needed.
6. Manage activities to avoid disturbance to sensitive species which would result in a trend towards federal listing or loss of population viability. The protection will vary depending on the species, potential for disturbance, topography, location of important habitat components and other pertinent factors. Give special attention during breeding, young rearing, and other times which are critical to survival of both flora and fauna.

Sensitive Species

In order to efficiently disclose anticipated effects of the alternatives on sensitive species, the nearly 50 individual species were grouped by general habitat preference. (Finch 1992; Hoover and Wills 1984). Current habitat composition, structural stage, and pattern were used to analyze effects by alternative. Effects were estimated at both the experienced and full implementation budget levels. Significant differences in effects between the two budget levels are noted.

The Biological Evaluation (BE) (Appendix J) provides a description of each species, as well as current and historical distribution of that species on the Routt National Forest. Sighting locations for each of these sensitive species on the Forest were completed and locations mapped on the GIS computer mapping system with assistance from the Colorado Natural Heritage Program, the Colorado Division of Wildlife, and others. The complete sighting records are included in the planning record.

Each proposed alternative includes forest-wide direction (goals and objectives and forest-wide standards and guidelines) to conserve and protect habitat for the plant and animal species that occur on the Forest and are included on the Regional Forester's sensitive species list. Many of these were disclosed as resource protection measures in this and other sections (i.e., water, riparian, wildlife, etc.).

For all proposed alternatives, the general forestwide protection measures apply. In addition, specific protection requirements apply for specific species or groups of species. See the "Resource Protection Measures" listed above for a complete list. These protection measures are assigned to each sensitive species for the Forest based on the following:

- Forest-wide direction:
  - Goals and Objectives (FWD-GO)
  - Forest-wide Standards and Guidelines (FWS&G)

Standard or guidelines designed to protect a specific species or group of species will be included by number of that standard. For example:

> Townsend's big-eared bat = FWS&G (TES) #2
>
> FWS&G (TES) #2 is Threatened, Endangered, Sensitive Species and Wildlife Forest-wide Standard number 2 which states: "Manage human disturbance at caves and abandoned mines where bat populations exist. When closing mines or caves for safety or protection reasons, reduce disturbance to residing bat populations and provide bat access."

Table 3-21 is a listing of Region 2 sensitive species and those Forest-wide Threatened, Endangered, Sensitive Species and Wildlife Standards (Forest Plan, pp. 1-14 through 1-15) designed to protect them.

The following species were included in the DEIS but were not analyzed for the FEIS: fisher, Wyoming pocket gopher, Prebles' meadow jumping mouse, swift fox, water vole, and harlequin duck. This was based on the latest corrections/changes in the Endangered, Threatened, Proposed, and Sensitive Species list for the Medicine Bow, Routt, and Thunder Basin National Grasslands, August 1997.

Table 3-21. Forest-wide Threatened, Endangered, Sensitive Species and Wildlife Standard Designed to Protect Routt National Forest Sensitive Species * (Forest Plan, pp. 1-14 through 1-15)

Mammals	1	2	3	4	5	6	7	8	9	10	11	12
Spotted bat		X						X				
Lynx								X				
Ringtail							X	X				
Pygmy shrew***							X	X				
Townsend's big-eared bat		X						X				
Marten**								X				
Fringe -tailed myotis		X						X				
Dwarf shrew								X				
Wolverine								X				
Birds												
Northern goshawk						X	X	X				
Greater sandhill crane***				X				X				
Olive-sided flycatcher **								X				
Columbian sharp-tailed grouse ***				X	X			X				
Ferruginous hawk				X		X	X	X				
White-faced ibis								X				
Merlin						X		X				
Osprey**						X		X				
Flammulated owl**							X	X				
Loggerhead shrike					X			X				
Fox sparrow***							X	X				
Black swift								X				

Black-backed woodpecker **							X	X				
Three-toed woodpecker **							X	X				
Golden-crowned kinglet								X				
Purple martin**							X	X				
Pygmy nuthatch								X				
Boreal owl**							X	X				
Back tern								X				
Lewis' woodpecker								X				
Long-billed curlew								X				
Reptiles/Amphibians												
Northern leopard frog***							X	X				
Wood frog***							X	X				
Tiger salamander***							X	X				
Boreal western toad ***							X	X				
Fish												
CO. River cutthroat trout								X				
Invertebrates												
Rocky Mountain capshell snail							X	X				
Cockerell's striate disc snail							X	X				
Plants												
Harrington's beardtongue								X				
Purple lady's slipper								X				
Rabbit Ears gilia								X				
Hanging Garden sullivantia								X				
Roundleaf sundew								X				
Livid sedge								X				
Colorado tansy-aster								X				

*In addition to Forest Goals and Objectives #1 (Forest Plan, p. 1-2), **Biological Diversity Standards #1 and #2 also apply (Revised Plan, p. 1-8), ***Range Standards (Revised Plan, pp. 1-9 thru 1-10) as well as Watershed Conservation Practices Handbook (FSH 2509.25,10), design criteria (Revised Plan, App B.)

Affected Environment

Mature Conifer Habitat

Late successional spruce/fir includes habitat structural stages 4b, 4c, and 5.

Late successional spruce/fir forests on the Routt National Forest can be classified into two distinct landscape patterns that often differ by elevational zone. Mid-elevation spruce/fir forests are usually larger, more contiguous blocks of late successional habitat. At higher elevations, this pattern is more fragmented by meadows, lakes, streams, and rock talus. Each of these distinct older-aged forests supports different understory plant communities and often different associated wildlife species.

Species known or suspected to occur on the Forest:

Black-backed Woodpecker

Three-toed Woodpecker

Marten

Northern goshawk

Boreal-owl

Olive-sided flycatcher

Pygmy shrew

Golden-crowned kinglet

Species with documented historical occurrences on or within the vicinity of the Forest, but not likely to currently occur:

Wolverine: several unconfirmed sightings over the last decade.

Lynx: no confirmed sightings in recent years. Could be extirpated.

Aspen Habitat

Habitat structural stages 3, 4, and 5.

Mature aspen stands have dense grass, forb, and shrub understories and provide habitat for a diversity of species, particularly birds. The relatively short life of aspen and annual shedding of its foliage create numerous micro-habitats not usually found in coniferous cover types.

Species known or suspected to occur on the Forest:

Purple martin

Merlin

Lodgepole Pine

Habitat structural stages 3, 4, and 5.

Lodgepole pine dominated habitat complexes are far more common on the east side of the Forest. The structure, composition, and function of the stands vary greatly depending on site conditions and stand age. Dense, stagnant stands of lodgepole provide little opportunity for understory diversity and provide little forage value. However, as they begin to mature and die from insects and diseases, they begin to exhibit mutli-stand structures, with increased snag and downed woody components. This provides more in composition diversity and increased wildlife habitat potential.

Species known or suspected to occur on the Forest:

Pygmy nuthatch

Ponderosa Pine - Due to ponderosa pine being very limited on the Forest, it has been included with lodgepole pine for purposes of this analysis. Species known or suspected to occur on the Forest.

Flammulated owl

Mixed Deciduous/Shrublands Habitat

Shrub communities on the Routt National Forest provide habitat for numerous wildlife species and are often used extensively during season migrations by small birds and big game. Sagebrush, snowberry, bitterbrush, oak brush, serviceberry, and chokecherry are

commonly found in shrub communities on the Forest. These berry-, bud-, and acorn-producing plants provide a major source of forage for wildlife.

Species known or suspected to occur on the Forest:

Ringtail

Columbian sharp-tailed grouse

Riparian/Wetlands Habitat

This habitat complex includes riparian ecosystems and wetlands associated with lakes, reservoirs, ponds, springs, and wet meadows. A variety of riparian plant communities occur on the Forest, the most common being willow- and alder-dominated. Dense vegetation provides cover and forage year-long and seasonally for many species. This habitat complex is used extensively by amphibians, reptiles, and migrating neotropical birds.

Species known or suspected to occur on the Forest:

Greater sandhill crane

Fox sparrow

Tiger salamander

Boreal western toad

Northern leopard frog

Wood Frog

Species with documented historical occurrences on or within the vicinity of the Forest, but not likely to currently occur:

White-faced ibis: occasional migrant within the vicinity of the Forest.

Lewis' woodpecker: confirmed as likely breeder in vicinity of the Forest.

Long-billed curlew: likely breeder in North Park, in vicinity of the Forest.

Black tern: not confirmed on the Forest, but occasionally observed in wetlands statewide.

Grasslands/Forblands

Grasslands, rangelands, and mountain meadows vary greatly on the Forest by soil type, slope, aspect, and elevation. Meadows lying within an elevational range of 7,000 to 12,000 feet occur in mountain valleys, swales, parks, and around potholes. Grasses and sedges give this habitat its characteristic appearance. Forbs are another important component and may comprise 20% or more of the total.

Species known or suspected to occur on the Forest:

Loggerhead Shrike

Ferruginous Hawk

Species with documented historical occurrences on or within the vicinity of the Forest, but not likely to currently occur:

Swift Fox: not confirmed on Forest and outside of published range.

Wyoming Pocket Gopher: published range near Craig, Colorado.

Open Water

The Forest contains approximately 1,990 miles of stream channels, 1,801 miles of which are perennial. The Forest has 201 lakes/reservoirs totalling 2,923 acres. Surface water is predominately from snowmelt runoff. Overall, water quality on the Forest is good.

Species known or suspected to occur on the Forest:

Colorado River cutthroat trout

Osprey

Rocky Mountain capshell snail

Cockerell's striate disc snail

Alpine/Talus

These are areas in which vegetation does not exist or is very sparse. Includes rock outcroppings and snow fields.

Species known or suspected to occur on the Forest:

Dwarf shrew

Caves/Mine shafts

Species known or suspected to occur on the Forest:

Townsend's big-eared bat

Fringe-tailed myotis

Spotted bat

Cliffs with Waterfalls

Species known or suspected to occur on the Forest:

Black swift

Sensitive Plants

Species known or suspected to occur on the Forest or documented in vicinity of National Forest lands:

Harrington beardtongue: This penstemon grows on pinyon/juniper and sagebrush dominated slopes. It has not been documented on the Forest but does occur in the vicinity.

Purple lady's slipper: This member of the Orchid family is found on the Forest. It occurs in openings or densely shaded areas of conifer forests, in duff under lodgepole pine and less frequently under spruce/fir.

Rabbit Ears gilia: This species occurs on the Forest in coniferous forest and scrub oak woodlands, openings and meadows.

Hanging garden sullivantia: Although this species has not been recorded on the Forest, it is found within the vicinity of the Forest. It requires cool, moist habitats usually found on cliffs of various geology in the riparian zones of canyons.

Roundleaf sundew: Roundleaf sundew occurs on floating peat mats, bogs, and on the margins of acidic ponds, fens, and kettle lakes. This species has been documented on the Forest.

Livid sedge: This species occurs as distinct populations in Colorado. It is associated with wet areas and has been documented on the Forest.

Colorado tansy-aster: This species is found in gravelly areas in mountain parks and rock outcrops between 8,500 and 12,500 feet in elevation. It is suspected, but not documented on the Routt. It is found on the Medicine Bow National Forest in Wyoming

Environmental Consequences

Mature Conifer Habitat:

Direct and Indirect Effects

Projected direct and indirect effects by alternative, for the short term and long term, on the predicted percentage change in composition and structure of late successional habitat is displayed in Figure 3-13.

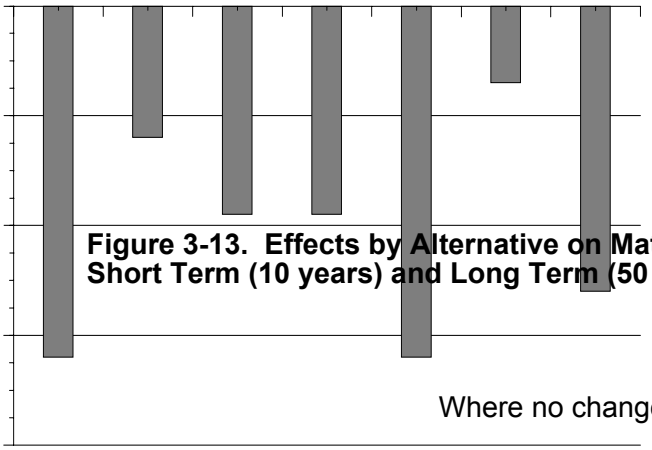


Figure 3-13. Effects by Alternative on Mature Conifer Habitat for Short Term (10 years) and Long Term (50 years) at the Full Budg

Where no change is predicted, it is indicat

0

Source: FORPLAN

Summary of Effects by Alternative

As is disclosed in Figure 3-13, the composition and structure pattern of late successional spruce/fir would not be significantly altered under any of the alternatives. This habitat currently composes about 23% of the total forested acres (Table 3-34). The management activities in the various alternatives maintain mature spruce/fir habitat just over 3% of current composition.

An analysis of the 29 geographic areas within the Forest indicates this habitat is well-distributed over the Forest and will not change significantly between alternatives. Compared to historical averages, patch sizes are smaller with less acreage in early structure stages. This is related to the function and severity of large stand-replacing fire. This pattern trend towards older structural stages and smaller stand sizes would not vary among alternatives.

The function of late successional habitat was analyzed specifically on how it related to connectivity and corridors. The GIS computer mapping system was used to evaluate effects of the alternatives on connectivity and travel corridors for specific areas of concern on the Forest. These areas appear to be fragmented due to natural barriers such as open river valleys or human-created barriers, such as main highways or other large developments. Generally, the Forest's late successional habitat would remain well-distributed and would provide adequate travel corridors and habitat linkages in all alternatives. However, eleven areas of concern were identified. The alternatives were evaluated to determine how many of these eleven areas would be adversely affected if they were implemented. Alternative G would affect all eleven, A would impact ten, E would impact nine, C would impact eight, B and D would impact six, and Alternative F would impact two. These impacts would be primarily due to proposed harvest and roading in or near the connecting corridors. The complete analysis and maps are included in the Routt National Forest Biological Diversity Report.

Aspen Habitat

Direct and Indirect Effects

There would be no significant change in the aspen habitat complex over the short term or long term resulting from any of the alternatives. Currently, aspen acreage is estimated at about 260,000 acres or about 20% of the total forested acres. This compares with an estimate of 20 to 25% historically.

Summary of Effects by Alternative

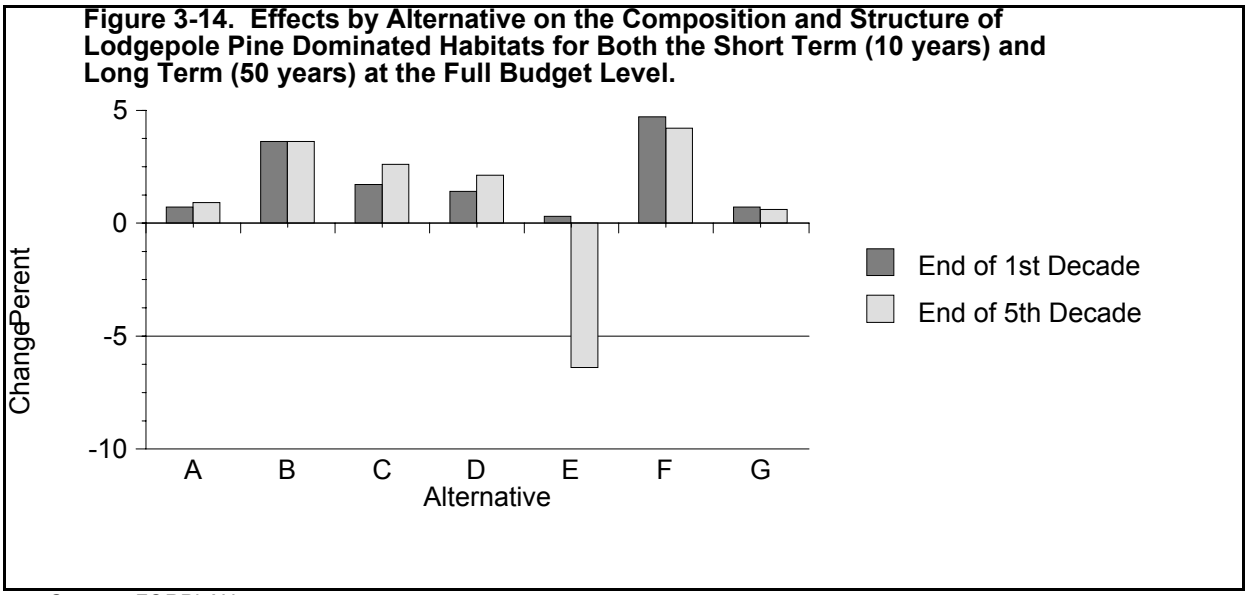
Aspen composition, structure, function, and pattern would not vary significantly by alternative. Aspen stands will continue to be older and smaller than the historical average due to decreases in large stand-replacing fires. The alternatives would not alter this trend. Management direction under all alternatives is to maintain aspen, even at the expense of other late successional cover types. An analysis of 29 proposed geographic areas indicates that aspen would remain well distributed over the Forest, with 20 of the 29 geographic areas composed of 10% or more mature aspen habitat.

Lodgepole Pine

Direct and Indirect Effects

The projected direct and indirect effects on the composition and structure of lodgepole pine dominated habitats over the short and long term are displayed in

Figure 3-14. The figure displays the predicted percentage change in composition and structure of lodgepole pine habitat forestwide.



Source: FORPLAN

Summary of Effects by Alternative

Lodgepole pine dominated habitat would increase slightly forestwide under all alternatives, except Alternative E which would have a 6% decrease for the long-term at the full budget level. This decrease in mature lodgepole would be the result of timber harvest. Effects at the experienced budget level would be less, with an increase of 4.7% for the short-term under Alternative F.

Lodgepole pine is currently at the low end of historical composition, at about 28% of the total Forest (Table 3-34). Historically, lodgepole was estimated to comprise between 35% to 45% of the Forest. Patch sizes have decreased over time due to the reduction in large stand-replacing wild fires. Patch sizes are not predicted to change under implementation of any of the proposed alternatives. An analysis of 29 geographic areas showed a range of 1% to 64% in total acreage of lodgepole pine stands. This was expected since lodgepole pine is far more common on the east side of the Forest and would not change significantly between alternatives.

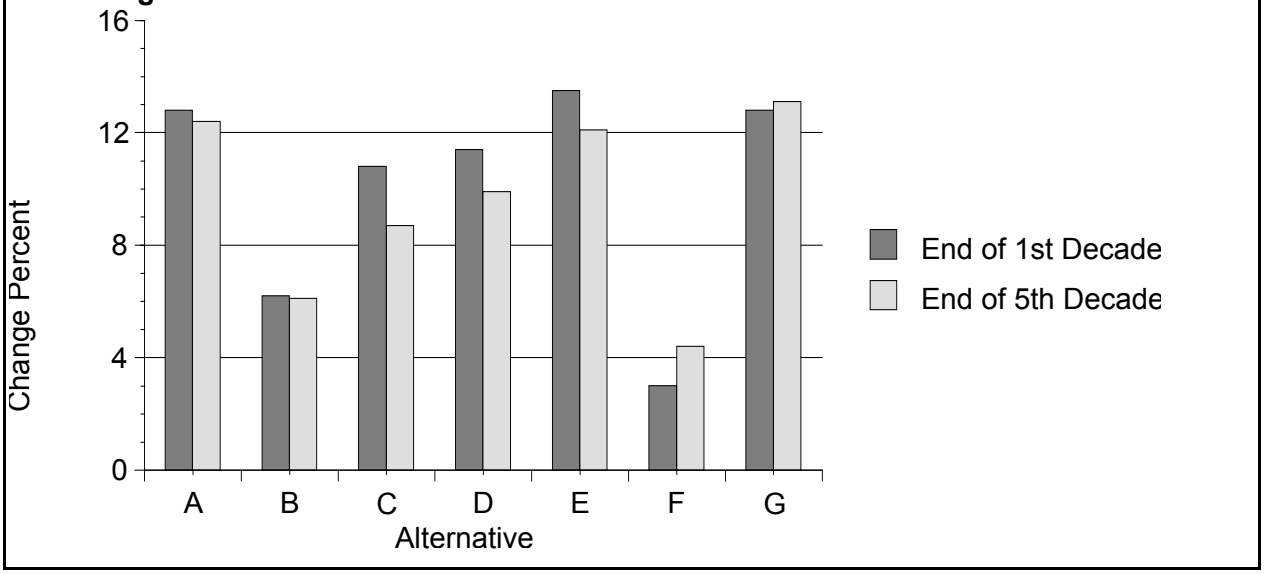
No effects to ponderosa pine habitats are anticipated with any of the alternatives. Ponderosa pine currently accounts for less than 1% of the Forest and would not vary significantly by alternative.

Mixed Deciduous/Shrublands Habitat

Direct and Indirect Effects

The projected direct and indirect effects on shrub habitats from the various alternatives for the short and long term are displayed in Figure 3-15. The figure displays the predicted percentage change in shrub composition forestwide.

Figure 3-15. Effects by Alternative on the Composition of Shrub-Land Habitat for Both the Short Term (10 years) and Long Term (50 years) at the Full Budget Level.



Source: Routt FORPLAN Model

Summary of Effects by Alternative

Under all of the alternatives, shrub habitat would be maintained within 13% of existing acreage (approximately 68,000 acres or about 5% of the Forest). Alternatives A, E ,and G would result in the most increase, primarily from acres harvested for timber. Alternatives B and F would result in less acreage being converted to shrubs. Effects of implementation at the experienced budget level would be less with an increase of slightly over 10% for alternatives A, E, and G over the short term, and between 7-8% at the long term. This increase would still be within the range of natural variability.

The predicted increase in shrub habitat is primarily due to forested cover types, mostly lodgepole pine, being temporarily converted to shrubland as a result of timber harvest. Current shrub-associated sensitive species would not likely benefit. These particular species are not forest-associated, and their occurrence in timber harvest areas is unlikely.

An analysis of 29 geographic areas indicates that shrubs currently comprise between 1% and 15%. Compared to the Forest average of 5%, this indicates that this habitat is well-distributed over the Forest and is currently at its high historical range of 2% to 4%. It is estimated that approximately 90% of the shrub species identified nearly 100 years ago are still present. This indicates that shrub structure has not changed significantly over the last 100 years and is not expected to under any of the alternatives.

Riparian/Wetlands Habitat

Direct and Indirect Effects

There are no predicted direct or indirect effects to Riparian/Wetland habitat for any of the alternatives.

Summary of Effects by Alternative

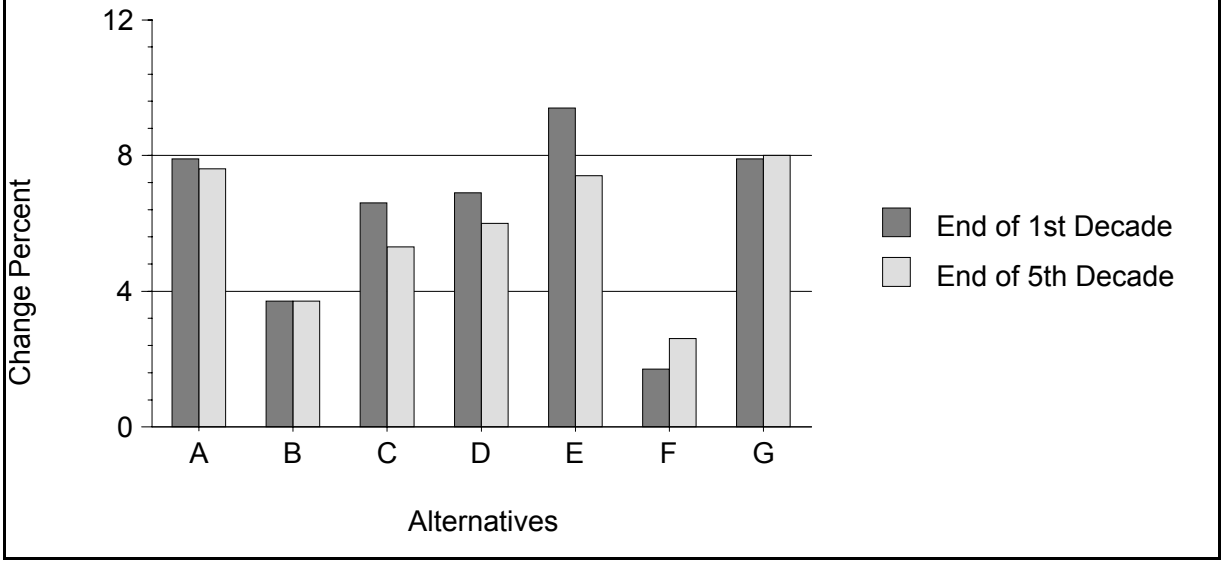
The acres of riparian and wetland habitats will not change by alternative. There are currently 61,352 acres on the Forest. Approximately 51,631 acres, or 84% is classified as riparian habitat, and 9,721 acres, or 16% is classified as wetland habitat.

Grasslands/Forblands

Direct and Indirect Effects

Figure 3-16 displays the predicted percentage change in grass/forb habitat forestwide under the seven alternatives, for the short and long term.

Figure 3-16. Effects by Alternative on the Composition of Early Successional (grass/forb) Habitats for Both the Short Term (10 years) and Long Term (50 years) at the Full Budget Level.



Source: Routt FORPLAN Model

Summary of Effects by Alternative

Due to projected levels of vegetative management, the total percentage of the Forest in the grass/forb habitat would increase under all alternatives for both the short and long term for the full budget level. This would vary between a high of 9% with Alternative E for the short term to a low of just under 3% with Alternative F over the long term.

This slight projected increase in grass/forb habitat, resulting primarily from timber harvest, would not likely benefit the current grass/forb-associated sensitive species. This is because these particular species are associated more closely with open plains grasslands and would not likely be found in the higher elevation forested areas where the transitory conversion from mature forest to grass/forb habitat would occur.

The projected percentage of coverage for all alternatives would remain within the natural range of variability of 8% to 10%. Pattern and distribution forestwide would not change significantly with any of the alternatives. Currently grass/forb habitat ranges from 2% to 35% coverage on the 29 geographic areas on the Forest.

At the experienced budget level, increases in grass/forb acreage due to increased level of acres harvested for timber would result in a 1 to 2% decrease in percentage. This would still be in the range of natural variability.

Open Water

Summary of Effects by Alternative

Open-water habitat will not change by alternative. There are currently 1,801 miles of perennial river and streams on the Forest and approximately 2,923 acres of lakes and reservoirs. All alternatives will maintain or create habitat suitable for a stable or increasing population of federally listed and Routt National Forest Sensitive Species, including the Colorado River cutthroat trout (Revised Plan, p. 1-2)

Alpine/Talus

Summary of Effects by Alternative

Alpine/talus is a unique habitat that will not vary by alternative. The Forest currently has approximately 54,000 acres of this high-elevation habitat.

Caves/Mine shafts

Summary of Effects by Alternative

This specialized habitat will not vary by alternative. Forest-wide standard and guideline # 2 (cave and mine shaft management) will ensure the protection of this important habitat for bats and some other species of wildlife.

Cliffs with Waterfalls

Summary of Effects by Alternative

No significant effects are anticipated under any of the alternatives. Resource protection measures designed to ensure water quality and riparian health would protect this specialized habitat from impacts of proposed management activities.

Sensitive Plants

Summary of Effects by Alternative

Three of the sensitive plant species (hanging garden sullivantia, roundleaf sundew, livid sedge) occur in riparian areas. Hanging garden sullivantia is not found on the Forest; roundleaf sundew and livid sedge are. Their habitat would be affected to the same extent as the riparian areas (see Water/Riparian/Wetland Section). These riparian areas receive protection under all alternatives through the application of the forest-wide standards and guidelines and the Watershed Conservation Practices Handbook (FSH 2509.25). The possibility for damage to riparian/wetlands habitat is greater in those alternatives with greater activity levels such as road building and timber harvesting. However, identification of riparian areas and known plant locations during project-level planning, and monitoring of best management practices should prevent adverse effects to these species.

The effects of the alternatives to both rabbit ears gilia and purple lady's slipper will be minimal. These plants exist in scattered populations across the Forest. Since application of the standards and guidelines is consistent in all alternatives, effects at the programmatic level are minimal. Any effects to individual populations will be mitigated at the individual project level with all alternatives.

Harrington beardtongue and Colorado tansy-aster have not been documented on the Forest. The allocations and management area prescriptions for all of the alternatives

would not affect the known populations of these plants. If this species should be documented on the Forest, application of the standards and guidelines will protect populations from detrimental effects. In general, the greatest potential threats to known populations of sensitive plants would be from proposed recreation developments and associated loss of habitat.

Effects From Management Activities

Effects from Fire Management - Fire management could have a variety of positive and negative effects on sensitive species. These effects include loss of individual species, displacement of some species, and improved habitat for early and mid-successional associated species.

Large catastrophic wildfire can seriously impair watersheds that are characterized by shallow soils on steep slopes. Severe wildfires not only destroy vegetation, but can detrimentally burn soils. Soils are considered detrimentally burned when most woody debris, litter, duff, and humus are consumed down to bare mineral soil. The effects of this can lead to the establishment of undesirable early successional vegetation, such as common mullen, lambsquarters, or noxious weeds, such as knapweed and thistle. These plant species could successfully compete against sensitive plant species and reduce the amount and distribution of forage and cover for other sensitive wildlife species.

The potential for catastrophic wildfire increases as stands mature, canopies close, and ground fuels build. The greatest potential for catastrophic wildfires exists in alternatives where the management emphasis limits access (nonmotorized recreation, research natural areas, wilderness). Limited access increases fire crew response time which may allow the fire to increase in size and intensity. Alternatives F and B would have the largest number of acres susceptible to catastrophic wildfire.

The effects described above could pertain to less intense wildfires or prescribed fires. Although, typically, these fires would burn fewer acres and be lower in heat intensity. Low intensity fires often increase soil productivity by releasing nutrients tied up in plants.

Sensitive species associated with grass/forb, shrub, and riparian communities would benefit most from prescribed burning or by allowing some wildfires burn naturally under conditions determined in a fire management plan. Alternatives B and F would result in more opportunity for prescribed natural fire as opposed to traditional fire control.

Effects from Fisheries Management - The management of fish habitat normally consists of instream structural or riparian habitat improvements. Normally both of these activities would result in higher quality aquatic and riparian habitat for associated sensitive species. This would be common under all alternatives.

Effects from Insect and Disease Management - Forest insects and diseases have always been a natural component of the Forest. Insects and disease, as well as fire, are important agents of disturbance which have shaped current habitat composition, structures, and pattern. The primary insect species has been the bark beetle, while the primary diseases include root diseases, dwarf mistletoe, and various aspen stem cankers.

Sensitive species that depend on snags or downed woody material benefit most from endemic (normal) levels of insect and disease activity. The more infrequent epidemic (high) levels of activity often result in large stand-replacing fires that are part of the disturbance processes. These fires have shaped current Forest ecosystems.

The alternatives would not differ significantly for predicted levels of endemic insect and disease activity.

The less frequent epidemic outbreaks can have negative effects on sensitive species habitat in several ways. Some examples include reductions in habitat for late successional and old-growth associated species and removal of large areas that provide habitat for interior-forest associated species.

Timber harvesting and related silvicultural activities can provide an ecological approach to prevention and reduced risk of major unwanted insect and disease outbreaks. Insect and disease outbreaks can have short and long term negative impacts to sensitive species habitat. The risk of undesirable outbreaks of insect and diseases can be related to the amount of acreage by alternative proposed to have silvicultural treatments of some sort. The acres available for timber stand improvements would be greatest under Alternatives E, A, and G, at the full budget level. The opportunity for treatment would be much less under Alternatives B and F.

Effects from Minerals Management - Exploration or development of minerals resources could directly and indirectly affect sensitive plants and animals through removal of species or displacement and disturbance due to habitat modification and increased human activity.

Approximately 35% of the Forest can be classified as having a high-to-moderate potential for locatable minerals. Most of the potential for these minerals is concentrated within a few areas on the Forest. Exploration and production of locatable minerals such as gold, silver, and others will continue to be driven by market prices. Land management prescriptions in the high-potential areas outside of the wilderness are common to all alternatives and would have little impact on the number of acres available for mineral entry. The exception is Alternative F, which would have more acres withdrawn from mineral entry.

The resource protection stipulations developed for the 1993 oil and gas leasing analysis have been adjusted to reflect the standards for each of the alternatives. While these stipulations will generally avoid most adverse effects to sensitive species associated with oil and gas production, it is reasonable to assume that alternatives having the most acres open for leasing pose the most risk for adverse effects. Alternatives A and C would prescribe the most acres open, followed in order by E, G, D, B, and F.

Effects from Range Management - Activities related to domestic grazing can impact sensitive species through habitat disturbance, modification, and in the case of sensitive plants, direct loss of species through grazing or trampling. It is important to point out however, that these plants have survived under grazing on the Forest for the better part of a century and were subjected to far heavier grazing during the settlement period over 100 years ago. Good range management practices and allotment management planning would minimize the effects of livestock grazing on sensitive plant and animal species.

Grazing would continue to be permitted under all alternatives. The levels of grazing proposed by alternative have been grouped into three categories, depending on the amount of restrictions.

Assuming that those alternatives with the least restrictions would potentially have more risk of adverse effects to sensitive species the alternatives would rank from most to least risk as follows; Alternative G, E, A, C, D, B, and F.

Effects from Recreation Management - Some types of recreational activities can result in direct habitat loss, habitat modification, and disturbance and displacement of species. Plant species may also be lost.

Concentrated recreation use around developed recreation sites (campgrounds, trailheads, and day-use areas) can result in trampled vegetation, soil compaction, and degradation to riparian areas. This can adversely impact sensitive plant and animal species associated with these areas. Any expansion or proposed new construction would include a biological evaluation to mitigate adverse effects to sensitive species.

Effects of dispersed recreation could include trampling of vegetation, soil compaction, overgrazing of some meadows by recreational livestock, the potential for introducing noxious weeds from livestock feed, and off-road vehicle use. Disturbance and displacement of vulnerable sensitive wildlife species, such as goshawks, bats, and many of the small Neotropical birds, may also be included.

Alternatives E, G, and B would provide the most opportunities for motorized recreation uses and potentially the greatest risk of introducing noxious weeds and disturbing sensitive species. Alternative F, with emphasis on nonmotorized recreation and additional wilderness, would pose the least risk to sensitive species. The other alternatives would pose similar risks to sensitive species.

Research has shown that snowmobile use has the potential to displace wildlife, can result in habitat loss, and can sometimes lead to mortality (Boyle and Samson 1985; Bury 1978). Behavioral responses can be of both short and long duration (Knight and Gutzwiller 1995). Snowmobiling can also damage shrubs and saplings, reduce vegetative standing crop, and create changes in species composition (id.), thus resulting in indirect impacts to species. The greatest impact appears to be on those animals that winter under the snow (subnivean) (Boyle and Samson 1985; Bury 1978).

Snowmobile use would be allowed on nearly 76% of the Forest, although the majority of use presently occurs in the Rabbit Ears area. Snowmobile use is expected to increase in the future (FEIS Figure 3-25; Knight and Gutzwiller 1995). As stated in the Revised Plan (p. 3-3), "The winter ROS classes are motorized and nonmotorized. They can be used to identify areas of high recreation value for motorized versus nonmotorized use and as a guide for managers where there is an identified need to zone winter uses."

In lower elevation areas, particularly Management Area Prescription 5.41 (Deer and Elk Winter Range), the ROS class is designated as semi-primitive nonmotorized in the winter and spring. Human activity will be prohibited during the winter and spring periods where conflicts with wintering wildlife are identified (Revised Plan, p. 2-49).

Few studies currently exist that show a good understanding of the direct and indirect effects of recreational disturbance on wildlife (Knight and Gutzwiller 1995). Most studies have focused on overt behavioral responses, and minimal information or research exists that addresses possible impacts at the population or community level (id.). Forest Plan standards exist which will help reduce impacts from recreational activities for some wildlife species (eg., elk calving and winter range areas, caves, protection of known active and inactive raptor nests and buffer areas) (Revised Plan, p. 1-14). Monitoring (Revised Plan, Chapter 4) will determine any site-specific changes necessary to future snowmobile use.

Effects from Road Management - Roads can impact sensitive species by direct removal of habitat during construction and reconstruction or indirect loss of habitat

associated with increased human use and disturbance associated with the use. This loss is greatly reduced when roads are obliterated. Generally those alternatives proposing the fewest miles of road pose the least risk to sensitive species and their habitat. Alternative F proposes the fewest miles of roads, followed by Alternative B, C, D, G, A, and E.

Effects from Timber Management - Timber management can have positive and negative effects on sensitive species. Conversion of over-mature and decadent timber stands through logging to early or mid-successional vegetation types often replicates natural disturbance patterns. This is generally beneficial to species associated with early and mid-successional vegetation and forest structural stages.

Timber management could also result in loss of individual species and habitat for those species associated with and requiring later stages of vegetative succession and mature and over-mature structural stages. There may also be temporary disturbance and displacement of species due the actual logging activities and increased human and vehicle use of the area proposed for harvest.

Cutting of dead trees and snags for firewood following timber harvest can affect the availability of cavities for nesting and security for sensitive species that are snag dependent. Under all alternatives, proposed standards and guidelines would mitigate this problem, particularly in areas adjacent to urban and suburban areas that are subject to heavy firewood gathering.

Other timber management activities, including thinning and tree planting, can have both positive and negative effects on sensitive species, depending on the habitat requirements and human tolerance of the species in question.

Effects from Wildlife Management - Generally, wildlife management projects would benefit sensitive species and their habitat. However, it is important to recognize that large projects designed to improve wildlife habitat (i.e., burning big game winter range) could have adverse effects on individual sensitive species, particularly plants. Any proposed project would include a biological evaluation designed to identify potential negative effects. Identification of negative effects would require re-designing the project for mitigation.

No differences would be expected among the alternatives.

Cumulative Effects

There is no protection or consideration afforded to Forest Service designated sensitive species on private or other public lands. Some sensitive species have a relative large proportion of their habitat located on private lands. This is particularly true of riparian and grassland-associated species. Management of these lands significantly affect the overall viability and distribution of these species from a cumulative effects perspective.

The total composition, structure, and function of sensitive species habitat complexes on the Forest would be slightly altered through implementation of any of the alternatives. This is true for both the short and long term. Overall the composition, structure, and pattern of habitats for sensitive species would not change significantly at the Forest planning level as a result of the land allocations and levels of activities proposed under the various alternatives.

The occurrence and distribution of many of the migratory sensitive species, such as the Neotropical migrant bird species that occur on the Forest, is only partially related to the

quality of Forest habitat. For these species, habitat on their winter ranges is as important as breeding habitat for maintenance of viable populations. No management requirements or mitigation requirements prescribed on the Forest could provide replacement habitat or compensate for the potential effects to these species due to the loss of critical habitat on non-Forest Service lands.

This analysis concluded that the greatest potential cumulative effect to sensitive species over time on Forest and non-Forest lands would be human-induced disturbance and displacement of species and habitat associated with road construction. In addition to timber management, other permitted activities, such as hydropower development, water projects, and minerals development, often require road construction for implementation. Roads constructed for these and other activities add to the total miles of road density both on and off the Forest.

Road closures and planned obliterations following project completion would partially mitigate these effects. However, it is reasonable to assume that the alternatives proposing the most miles of road over time would pose the greatest risk of adverse cumulative effects to sensitive species. The alternatives with the most miles of road proposed would be G, followed by A, E, D, C, B, and F.

Determination of Effects on Sensitive Species

It is the determination of the biological evaluation (Appendix J) that the levels of management activities proposed in all of the alternatives **"may adversely impact individuals, but would not likely result in a loss of viability on the Planning Area nor cause a trend to federal listing or a loss of species viability rangewide."** This determination is based on the minimal changes in the composition, structure, function, pattern, and distribution of sensitive species habitat and the implementation of mitigation measures designed to protect sensitive species and their habitat. This would be the determination at both budget levels.

Determination of Effects of the Proposed Alternatives on Species Viability

The final determination (above) is true for both the experienced and full implementation budget levels. It is also concluded that fish and wildlife habitat would be managed to maintain viable populations of existing native and nonnative vertebrate species on the Forest under all the alternatives.

This determination and conclusion is based on the following:

> There are no adverse impacts to threatened, endangered, or sensitive species resulting from the forestwide programmatic decisions under any of the alternatives.
>
> Conservation agreements between the Forest Service and other state and federal agencies will be developed and approved as necessary for candidate and sensitive species to preclude the need for federal listing or prevent extirpation of the species from the planning area.
>
> Sensitive plants and habitat for all listed or sensitive animal species are protected by management area prescriptions which prohibit ground-disturbing activities (wilderness, research natural areas, core areas, etc.). The acreage allocated to each prescription varies by alternative.
>
> There is little predicted change in habitat complexes over the short term (10 years) or long term (50 years) for any of the proposed alternatives at

the Forest, section, or province level. An analysis of 29 geographic areas within the Forest indicated that current habitats will continue to be well-distributed and remain within the range of natural variability.

A forestwide GIS computer mapping analysis of potential old-growth stands determined that adequate blocks of late successional or old growth habitat will be well-distributed over the Forest to link ecosystems within and adjacent to the Forest and ensure species dispersal and recruitment.

An analysis of road density and habitat effectiveness indicates that levels will not vary significantly from the current for any alternative over the short or long term.

At either the province or section level, adequate habitat is available to ensure viability for all species analyzed. No animal species is restricted to just the Forest or dependent exclusively upon habitat within the Forest to maintain viability.

Biological evaluations would be completed for projects or activities permitted under this Revised Plan to address the effects on sensitive plants. The following are examples of general measures that could be employed to avoid or mitigate impacts to sensitive plants:

- Avoid the sensitive plants or their habitat.
- Limit the degree or magnitude of the impact.
- Reduce impacts by requiring timing stipulations.
- Repair, rehabilitate, or restore following the activity.
- Compensate by creating or enhancing other habitat.
- Consider alternative methods to complete the activity.

All alternatives include specific direction, standards, and guidelines that address each sensitive species or assemblage of sensitive species. The proposed management area prescriptions have additional standards and guidelines designed to protect sensitive species and their habitat. These standards and guidelines vary by alternative in the number of acres to which they would be applied.

Fire Management

Introduction

Wildfire has been an important influence on Forest vegetation. Most of the Forest's lodgepole pine and aspen stands originated as a result of fire. This is also true for many of the spruce/fir stands. Evidence suggests that during 1870-1890 conditions were dry, and fire was a common event. It is estimated that 20 to 60 percent of the Forest burned between 1870 and 1900 (Routt National Forest 1994).

The Routt is generally in a low-frequence/high-intensity fire regime. There are few fires on the forest. Consequently, fuel loads tend to build resulting in potentially large, high intensity fires. This is reflected in the stand turnover intervals and fire return intervals for the forest. The stand turnover interval is the average time period required for fire to revisit an individual stand. The fire return interval is the average period of time required

for fire to revisit a general area. These are shown by cover type in Table 3-22. As the table shows, fire frequency varies with cover type.

Table 3-22. Stand Turnover and Fire Return Interval by Cover Type		
	Stand Turnover Interval	**Fire Return Interval**
Spruce/fir	500	200
Lodgepole pine	300	200
Aspen	200	70-100

Source: Routt RNV 1994

Table 3-23 shows the history of fire on the Forest since 1909. Table 3-24 show averages for the same period. Time periods are used to display the information because different reporting techniques were used for the periods shown. For the most recent period, which probably has the most reliable data, the Forest has averaged about 8 lightning- and 10 human-caused fires per year over 1.3 million acres. These fires have burned, on average, 134 acres per year. The average fire size over the 25-year period from 1970-1995 was 7.45 acres. The largest fire was 1104 acres.

Table 3-23. Fire Total by Period

	Cause		**Total**	
Period	Lightning	Man	Total # Fires	Acres Burned
1909-1939	35	156	191	1,437
1940-1969	101	216	317	1,640
1970-1994	194	257	451	3,355

Table 3-24. Averages by Period

	Cause		**Total**	
Period	Lightning	Man	Total # Fires	Acres Burned
1909-1939	1.1	5.0	6.2	46.4
1940-1969	3.4	7.2	10.6	54.7
1970-1994	7.8	10.3	18.0	134.2

Sources: Routt NF Fire records

To illustrate the difference between different fire regimes, the Coconino National Forest in Forest Service Region 3 has a high-frequence/low-intensity fire regime. Between 1960 and 1974 that forest had an annual average of 163 lightning fires/million acres (Barrows 1978). The annual fire occurrence figures for the Routt translate into 6.2 lightning fires/million acres. The Coconino has the highest incidence of lightning fire/million acres of any forest in the National Forest system (Barrows 1978). The Routt has some of the lowest (Barrows 1978 and Ryan 1976).

Fires generally fall into one of two categories; prescribed burns or wildland fires. A prescribed fire is any fire ignited by management actions to meet specific objectives. A wildland fire is a fire resulting from an unplanned ignition; it requires an appropriate management response to control its spread. Escaped fires are a third category. An escaped fire is a prescribed fire that exceeds its prescription or a wildland fire that exceeds the initial level of control actions and needs to be reevaluated through a Wildland Fire Situation Analysis.

For a prescribed burn, a fire plan must be written and approved and NEPA requirements must be met before the burn is initiated. Prescribed fire is currently used for habitat

improvement projects on a very limited scale. The future may include using more prescribed fire to accomplish resource management. However, location and timing of the prescribed fire will be decided on a site-specific basis after an adequate analysis, including fire hazard, fire risk, and resource values.

In the past, the strategy for wildfire management has generally been suppression. Today wildland fires are controlled by one of three strategies: direct control, perimeter control, or prescription control. Direct control is the immediate and complete extinguishment of a wildfire. Usually this control is restricted to new fire starts, to steady-state fires that have not reached large sizes, and to selected portions of large fires. Direct control also includes exposure protection in which critical resources, such as houses, are shielded from the fire.

Perimeter control is a strategy that seeks to confine the active zone responsible for fire spread. Actual fireline location will be selected to minimize the combined cost of suppression and the values that could be lost in the fire. Fire's beneficial effects may also be used to determine fireline location. Under prescription control, fire is considered to be controlled as long as it burns within specified geographic boundaries and predetermined burning properties. These parameters are contained within a written prescription documented in the Fire Management Plan and verified at the time of ignition. Fires that are advancing management goals in the prescription are allowed to burn.

Management area standards and guidelines have listed the types of control that can be used for each management prescription area. As fire management plans are developed for specific areas of the Forest, these types of control may be refined.

Legal and Administrative Framework

- **The Organic Administration Act of 1897** authorizes the Secretary of Agriculture to make provisions for the protection of national forests against destruction by fire.
- **The Bankhead-Jones Farm Tenant Act of 1937** authorizes and directs the Secretary of Agriculture to develop a program of land conservation and land utilization to protect the public lands.
- **The Wilderness Act of 1964** authorizes the Secretary of Agriculture to take such measures as may be necessary in the control of fire within designated wilderness.
- **The National Forest Management Act of 1976** directs the Secretary of Agriculture to specify guidelines for land management plans to ensure protection of forest resources.
- **The Clean Air Act of 1977** provides for the protection and enhancement of the nation's air resources.

Key Indicators

- Structural stage.
- Management area prescription.

Affected Environment

Across the Forest, fuel loading is increasing as vegetation moves toward mature and late successional stages (See EIS Vegetation section for description of structural stages). This increases the potential for large stand-replacing wildfires. Current conditions are described in Table 3-25. As use of the Forest and development of adjacent private land continue to increase, fire risks will also increase.

Table 3-25. Habitat Structural Stage Descriptions

Structural Stage Name and Number	Percent of Forested Total
Grass/forb - 1	1.3
Seedling/sapling - 2	2.5
Pole (Total) - 3a, 3b, 3c	35.4
Mature (Total) - 4a, 4b, 4c, 5	60.9
Late Successional Component - 4b, 4c, 5	49.1

Source: GIS (DWRIS), vegetation layer

Environmental Consequences

General Effects

Naturally occurring fire hazard can be related to age, stand structure, and stand density. Fire hazards are greatest in older stands where an accumulation of ground fuels has occurred. On the Routt, 61% of the forested lands are mature, 35% are pole sized, and 3% are seedling/sapling. Therefore, more than half the forested lands are in or approaching a high fire hazard condition. The percentage of forest land in mature condition is projected to increase under all alternatives. This in turn will increase the fire hazard under all alternatives.

In addition to fire hazard, the risk of ignition must be considered. Lightning risk remains constant for all alternatives. There is no specific pattern to lightning ignitions. Over a long period of time, lightning-caused fires are scattered over the entire general forested area. However, the risk of human-caused fires does vary among the seven alternatives. As the level of human activity increases, so does the risk of a human-caused fire.

Values are also key in a description of the forest fuel/fire situation. Urban interface zones, regenerated stands, unique habitats, domestic watersheds, and highway (visual) corridors are a few examples of high or moderate values. Other areas would have low or moderate resource values.

Acreages under the three wildland fire control strategies vary by alternative. The control strategy or strategies are establish for each management area in the Revised Forest Plan. Table 3-26 shows which management areas use which control strategies. Table 3-27 shows the acreage in each of the control strategies by alternative.

Table 3-26. Management Area Wildland Fire Control Strategies

Prescription or Perimeter	Perimeter or Direct	Prescription, Perimeter, or Direct
1.11	3.23	2.1
1.12	4.3	4.2
1.13	5.11	5.41
1.2	5.12	7.1
1.32	5.13	
1.41	5.21	
1.5	8.22	
2.2		
3.21		
3.31		
3.4		
3.55		

Table 3-27. Management Area Wildland Fire Control Strategies Acres by Alternatives

Alt	Prescription or Perimeter		Perimeter or Direct		Prescription, Perimeter or Direct	
	Acres	Percent	Acres	Percent	Acres	Percent
A	465,000	34	848,800	63	44,800	3
B	840,600	62	390,900	29	127,100	9
C	592,100	44	639,500	47	127,000	9
D	710,300	52	528,100	39	120,200	9
E	399,800	29	869,500	64	89,300	7
F	1,114,800	82	231,300	17	12,500	1
G	383,000	28	859,500	63	116,100	9

Source: Acres from GIS (ARC/Info), allocation layers

Acres Burned by Wildfire

It is not possible to predict the acres burned by wildfire by alternative. The seasonal weather and fuel variables, combined with organization/budget constraints, would make any prediction very generic, and there would be no supporting data or research .

Direct and Indirect Effects

Effects from Timber Harvesting - Timber harvest activities generally reduce the natural fuel loadings. As the forest ages and moves into late successional stages, fuel loading increases. Timber harvest moves the forest into earlier seral stages, generally reducing the fuel loading. Timber harvest activities that create large canopy openings can also reduce the potential for fires that move through the crowns of the trees, independent of surface fuels.

Slash or activity fuels are created through timber harvest. However, this increase in fuels and associated increased risk of ignition are mitigated by the administration of timber sale contract. Specifically, risks are reduced by contract provisions requiring fire preparedness and hazard recognition related to timber purchaser operations. Timber harvest contract provisions require timber purchasers to conduct their operations using fire precautionary measures. Some of those measures are listed below :

- The presence of fire extinguishers and fire fighting equipment on the site.
- Approved mufflers and spark arresters on all internal combustion engines.
- Prohibitions and constraints on smoking and the construction and use of camp, lunch, and warming fires.
- Proper storage and use of flammables.
- The release of crews and equipment to fight fire within a certain distance (usually 5 miles) of purchaser's operations.

The increase in activity fuels is also mitigated by timber sale contract provisions for slash reduction or removal. The timber purchaser is required to lop and scatter logging slash to certain depths or pile slash for later burning. This greatly reduces the buildup of slash and the risk of fire.

General statements about fuel levels in stands receiving timber harvest treatment versus fuel levels in untreated stands cannot be made. The situation depends greatly on the type of timber harvest treatment and the amount of slash disposal prescribed for the harvest area. For example, clearcutting in combination with slash treatment leaves less available fuel than either harvested or natural stands without slash treatment. Commercial thinning in sawtimber stands may initially create more fuel than is present in untreated stands. However, the overall hazard is reduced by slash disposal treatments of lopping and scattering and the compaction of the scattered slash by subsequent yearly snow cover.

Pre-commercial thinning of seedling/sapling stands creates additional slash. However, the slash is usually lopped and scattered to lie 18-24 inches deep on the ground. Again, snow cover in succeeding years compacts the slash thus reducing the overall hazard.

Timber harvest levels are lowest in Alternatives B and F. This affects the fire control program by allowing a greater percentage of stands to grow into late successional vegetation stages. The probability of a stand replacement fire then increases as dead fuels and ladder fuels build up. The resulting fire would also be more intense.

Alternatives A, E, and G have the opposite effect. Timber harvest decreases crown densities, ladder fuels, and late successional structure on a greater number of acres. The effects of Alternatives C and D will be somewhere between Alternatives B and F (lower harvesting levels) and Alternatives A, E, and G (higher harvest levels) .

Effect from Travel Management - The density of roads with unrestricted motorized travel can increase the risk of ignitions while at the same time facilitating fire control efforts. Motorized roads provide access which increases the level of human activity and correspondingly increases the risk of human-caused ignitions. However, the access provided by these roads can also improve fire crew response time and increase the effectiveness of the control efforts. The reverse is also true. Limited access in many areas may hamper control efforts by increasing report and response times and allowing fires to grow in size and intensity before the fire crew arrives.

Effects from Recreation - Recreation use of the Forest is expected to increase under all seven alternatives, but this increase is projected to be less in Alternative F. The increase in recreation use is accompanied by an increased probability of human-caused ignition. This is true for both developed and dispersed recreation. In dispersed recreation areas, the increased risk of human-caused ignition is compounded by the lack of access for fire control efforts.

In Alternatives B and F, the extent of the semi-primitive nonmotorized allocations will affect the access and response time for fire control, possibly allowing fires to increase in size. However, perimeter and prescription control have been identified as the appropriate fire strategies in these areas. Perimeter or prescription control strategies allow more flexibility than the direct control response which emphasizes keeping the fire as small as possible. Larger fire sizes are accepted once a perimeter or prescription control strategy is chosen.

Cumulative Impacts

Fuel loads will increase under all alternatives. The increase will be smaller in those alternatives with higher timber harvest levels.

The risk of ignition from lightning will remain constant under all alternatives. The risk of human-caused fires will increase under all alternatives due to projected increases in forest visitor use.

In alternatives with less motorized access to the Forest, the risk of large fires increases due to an increase in fire crew response time.

Rural development will occur in areas bordering the Forest. As this occurs, emphasis will need to be placed on reducing hazard fuels adjacent to these developments.

Fisheries and Aquatic Habitat

Introduction

The fisheries resource on the Routt National Forest is comprised of 18 identified species adapted to a variety of cool or cold water habitats in lakes, reservoirs, and streams. This diversity of fish species includes those that are native (occurred historically on the Forest), naturalized (species that were introduced from other areas and have successfully reproduced), and other introduced species that are not capable of successful reproduction, including some hybrid species. Table 3-28 lists the species by the three categories.

Table 3-28. Fish Species Known to Occur on the Routt National Forest			
Species	**Native**	**Naturalized**	**Introduced**
Colorado River cutthroat trout	X		
Mottled sculpin	X		
Speckled dace	X		
Mountain whitefish	X		
Creek chub	X		
Mountain sucker	X		
Rainbow trout		X	
Brook trout		X	
Brown trout		X	
White sucker		X	
Longnose sucker		X	
Flathead minnow		X	
Northern pike		X	
Lake trout			X
Golden trout			X
Artic grayling			X
Kokanee salmon			X
Tiger muskellunge			X

In addition to the species listed in Table 3-28, there are also several subspecies of cutthroat and rainbow trout that have been widely introduced on the Forest. Many of these introduced subspecies are naturalized or producing fertile hybrids with Colorado River cutthroat trout.

Based on stream inventories and habitat surveys, aquatic species (other than fish) and vegetative habitat are diverse and well distributed over the Forest. Aquatic insects, mainly stoneflies, mayflies, and caddisflies, are common and are a principal source of food for trout species.

Historic Trends

Fisheries habitat, species diversity, and population levels have experienced many changes over the past 150 years. As early as 1840, beaver trappers were active in this area and may have been transplanting fish into previously unstocked habitats and altering the mix of species in others. By the turn of the century, fish hatcheries were being established across Colorado.

Stocking programs were being initiated by both federal and state agencies. Habitat alterations during this era included dam construction, irrigation ditches, roads, railroads, logging, mining, and agriculture. The first aerial stocking of fish on the Forest, in 1955, radically changed the distribution of fish species in previously inaccessible areas.

Legal and Administrative Framework

Many federal laws and regulations authorize and direct how watersheds on lands administered by the USDA Forest Service are to be managed. Some provide broad authority and others are narrowly focused. Examples of the more important laws that specifically address watersheds and fish habitat are:

- The Organic Administration Act of 1897 (16 USC 475).
- The Federal Water Pollution Control Act (Clean Water Act) 1948 1987.
- The Sustained Yield Forest Management Act of 1944.
- The Multiple Use Sustained Yield Act of 1960.
- The Endangered Species Act of 1973.
- The National Forest Management Act of 1976.

Regulations have been passed that support and interpret these laws and require protection of surface resources from all natural resource management activities. A watershed analysis is required as a part of all planning activities (36 CFR 219 and Forest Service Manual 2500). Under 36 CFR 219.19 (Fish and wildlife), the Forest Service is directed to consider the effects of planning alternatives on fish and wildlife. Forest Service Manuals 2500 and 2600 (watershed and fish and wildlife) state Forest Service policy and direction regarding watershed and fish habitat management. Forest Service Handbook (FSH) 2509.25,10, Watershed Conservation Practices, Design Criteria, (Plan, Appendix B) will also provide protection to fish and fish habitat.

Key Indicators

- Miles of road proposed for construction.
- Erosion potential of acres proposed for treatment.
- Estimated number of stream crossings.
- Watersheds entered by risk class.

Resource Protection Measures

The implementation of forest-wide standards and guidelines, best management practices (BMPs), and minerals leasing stipulations, all contribute to the resource protection measures for fisheries. The majority of the fish habitat standards and guidelines in the alternatives are defined by soil and water concerns and are designed to protect and maintain such elements as stream channels, streambanks, riparian vegetation, and water quality. There are also a variety of standards and guidelines that are designed to protect fish and aquatic habitat. For example, an objective for the Routt National Forest is the maintenance or creation of habitats suitable for a stable or increasing population of federally listed threatened and endangered species and Forest Service, Region 2 sensitive species for the Routt, including the Colorado River cutthroat trout (Revised Plan, page 1-2).

The Colorado River cutthroat trout has also been selected as a management indicator species and would be monitored during project implementation to indicate the effects of management activities on fish and fish habitat.

Affected Environment

The Routt National Forest has approximately 1,990 miles of streams. Of that total, 1,801 miles are perennial and contain one or more species of fish. The Forest also has 201 lakes and reservoirs totaling 2,923 acres. Surveys indicate the majority of these aquatic systems contain suitable habitat for coldwater fish species. These aquatic ecosystems

are located within 143 watersheds ranging in size from approximately 1,000 acres to 20,000 acres.

The 1983 Plan estimated that fishing-related recreation activities comprised nearly 14% of the total recreation days generated on the Forest or approximately 174 thousand recreation visitor days.

Special land use applications and permits for water storage and diversions have increased on the Forest. There are currently 82 ditch permits, 39 dam and reservoir permits, and 10 water pipelines that account for approximately 2,200 acres under permit.

Various laws prior to the Federal Land Policy and Management Act of 1976 provide for rights-of-way over public lands. The Forest Service has the responsibility for all existing grants and permits located on National Forest System Lands, including their administration, amendment, and renewal when authorized and appropriate.

The 1983 Plan contains provisions to protect aquatic habitats. The Revised Plan has new provisions to prevent damage to perennial streams and assist the recovery of those that are currently depleted.

Based on several decades of Forest stream inventory and aquatic habitat surveys, there is a wide variety of stream habitats on the Forest. These instream aquatic habitats are described as: percentage of pool, riffle, and glide habitat; structural associations of the broad habitat types; substrate composition and distribution; bank conditions; cover attributes; and amount of large organic debris. Water quality variables such as temperature, ph, dissolved oxygen, and other attributes affect the quality of habitat. All stream habitats on the Forest are susceptible to both in-channel and off-channel, or upslope activities.

To rate the health of Forest watersheds, a watershed health analysis was completed. The analysis was based on a series of variables, including past management activities. Healthy watersheds exhibit desirable qualities that support productive, diverse, and stable populations of fish, aquatic insects, and streamside vegetation. Healthy watersheds also have a natural range of habitat features, such as depth of pools, composition of substrate, and sequence of pools and riffles.

Environmental Consequences

General Effects

Fish and aquatic habitat can be affected by a variety of management activities and practices, including road construction, timber harvesting, fire management, recreation management, water depletion and diversion, and minerals management.

One the most important effects to disclose from the proposed management activities by alternative is the potential amount of sediment being added to the aquatic systems. The addition of sediment to aquatic systems as a result of watershed disturbance and erosion eliminates aquatic insect habitat, reduces the permeability of spawning gravels, and degrades pools, over-wintering areas, and rearing areas (Marcus et. al. 1990).

Road construction and use is the greatest potential sediment source over both the short-term and long-term (Furniss et al. 1991). Roads constructed in riparian areas can constrict floodplains and channels resulting in changes to channel morphology and fish habitat (Furniss et. al. 1991).

No substantial effects to the fish resource due to road construction and use are expected if best management practices, standards and guidelines, and mitigation measures are followed. However, the risk of an adverse effect increases in relation to the miles of roads constructed and streams crossed. Risks include the adverse effects of sedimentation from unplanned events such as road failures or washouts of culverts and bridges and the failure of culverts and bridges to pass fish, even though they were designed to allow passage.

Direct and Indirect Effects on Fisheries and Aquatic Habitat

Proposed Miles of Road Construction

Table 3-29 discloses the proposed mileage of system roads to be constructed and reconstructed for different levels of proposed timber harvest. Erosion indices (an index that rates the potential for soil erodibility) and projected number of stream crossings are also disclosed by alternative. It is assumed that there will be one stream crossing for each 7 miles of road constructed or reconstructed, based on Forest averages. Effects displayed are for the experienced budget level.

Potential risks of adverse effects from road construction and stream crossings are not entirely dependent on road miles constructed. The alternatives were ranked using an erosion index that takes into account the potential for soil erosion concurrently with the miles of proposed road and stream crossings. Alternative E would pose the highest risk of adverse effects, followed in decreasing order of risk by alternatives A, G, D, C, B, and F. The risk ranking by alternative for the experienced budget level would be G, E, A, D, C, B and F (see Table 3-5 of FEIS).

Table 3-29 Comparison of Miles of Road Proposed for Construction/Reconstruction, Erosion Index and Estimated Stream Crossings by Alternative at the Full Budget Level (per year)

Alternative	Road Miles	Erosion Index	Est. Stream Crossings
A	37.4	14540	5
B	19.6	6678	3
C	26.4	9460	4
D	27.1	9780	4
E	40.4	15880	6
F	6.3	2717	1
G	36.4	14040	5

Source: Road miles from FORPLAN

Watersheds Entered

For each of the seven alternatives, Table 3-30 displays the number of watersheds by risk class that are predicted to be entered during the first decade. A total of 143 prescription watersheds on the Forest were rated using a watershed health matrix that included variables such as geologic hazard, road miles, trail miles, and past harvesting, to rate the current condition of the watershed and to predict the risk of management activities. A total of 87 watersheds are within the suitable timber base and considered to be available for managing timber. Of these, 43 are considered to be low risk watersheds, 12 are considered to be moderate risk, and 32 are considered to be high risk.

Table 3-30. Estimate of Watersheds Entered by Risk Class by Alternative At the Full budget Level, (per year)

Watersheds Entered	A	B	C	D	E	F	G
Low	45	32	43	44	52	20	50
Moderate	8	8	6	6	8	7	9
High	25	20	24	21	22	16	20
Total	78	60	73	74	87	44	85

Source: FORPLAN

By analyzing the number and class of watersheds entered and the acres proposed for harvest, potential risks to watershed health can be predicted. Using the number of acres harvested by risk class, the potential risk of adverse effects to watershed health, and ultimately fish habitat risk, would be highest under Alternatives A, E, and G; followed by Alternatives D, C, B, and F.

It is important to note that the alternative risk does not correlate exactly with the number of watersheds entered. If not evaluated this way, effects of alternatives harvesting the same number of acres but entering fewer watersheds to produce that timber volume would be similar.

The alternative rankings would not change at the full implementation level.

Effects from Proposed Management Activities

Effects from Fire Management - Fire can have both positive and negative effects on fish and their aquatic habitat. Native fish species such as cutthroat trout evolved under fire driven ecosystems in the Rocky Mountains. Fire is the catalyst that "triggers" nutrient dependent releases of important elements such as calcium and potassium into the aquatic systems.

Key physical components of a fully functioning aquatic ecosystem include complex habitats consisting of floodplains, banks, channel structure (i.e. pools and riffles), and subsurface waters. These are created and maintained by upslope disturbance processes, including fire, that supply nutrients, woody debris, and water.

Over time (100 years or more), streams are clearly disturbance-dependent systems. To maintain aquatic viability throughout a large drainage basin, it is necessary to maintain features of the natural disturbance regime. Fire is a very important factor in this natural disturbance regime for Forest ecosystems, and aquatic health is linked closely to it.

Large uncontrolled wildfires can have short-term detrimental effects, particularly to certain fragile soil and channel types, in the form of increased sedimentation, channel degradation, and temperature extremes.

Alternatives that propose the greatest use of prescribed fire to reduce fuels and manage vegetation would directly benefit aquatic habitat, while concurrently reducing the risk of large catastrophic wildfires that could, at least in the short term, damage aquatic systems. Alternatives that emphasize nonmotorized recreation or allocate land to nonmanaged "core areas" will affect the Forest's fire suppression program by increasing response times. This would result in a greater risk of small fires growing in size and intensity. Alternatives F and B would pose the greatest risk of large catastrophic wildfires.

Effects from Lands And Special-Use Management - Dams and water diversions can have significant effects on aquatic and riparian habitat and fish migration by changing

channel dimensions, altering aquatic and riparian habitat, and obstructing fish migration. The degree of these effects is currently unknown.

The Forest Supervisor has the authority and responsibility to assure that permits are consistent with the provisions of the forest plan. As permits are amended, renewed, or issued, the Forest will analyze environmental effects to determine if additional mitigation measures or new terms and conditions are required.

Effects would be similar under all proposed alternatives, since the compliance standards included in permit issuance would not vary by alternative.

Effects from Minerals Management - Mining and fossil fuels extraction can affect fish and aquatic habitat. Mining can be a significant source of bedload sediment or toxic heavy metals introduced into streams. Other risks include altered streamflows and channels, acid-mine drainage, toxic substance spills, and altered temperatures. Normally, water is needed in mining operations, and this depletion of streams or underground aquifers may also adversely affect fish habitat.

Both hard rock mining and oil and gas leasing operations proposed on National Forest System lands include a variety of resource protection stipulations and requirements. These operations are carefully monitored to ensure compliance with the terms of the mine operating plan or lease agreement. Even though these protection measures are required under all proposed alternatives, it is still reasonable to assume that those alternatives that open the most acreage to mining or oil and gas leasing potentially pose the greatest risk of adverse direct, indirect, or cumulative effects to fish and aquatic habitat.

In terms of risk assessment, the alternatives, from greatest to least risk, would be ranked as follows: Alternative A would open the most acres to mining, followed in order by C, E, G and B, and F.

Effects from Range Management - Domestic grazing can have adverse effects on fisheries and aquatic habitat. There is an abundance of literature that demonstrates that improper grazing or "overgrazing" degrades streams, riparian vegetation, and ultimately fish populations.

There is also ample literature to demonstrate that well-managed grazing is fully compatible with aquatic ecosystems and fish habitat. Timing of grazing and livestock distribution are two key elements that contribute to a successful, well-managed grazing system in riparian areas.

All alternatives provide for grazing permit management that either maintains or moves individual grazing allotments towards satisfactory condition. Acres open to grazing is similar under all proposed alternatives except Alternative F. There are differences between the alternatives on restrictions placed on grazing. Assuming that the alternatives that place the fewest restrictions on grazing also pose the greatest risk to fish and aquatic habitat, the alternatives would rank G, E, A, C, D, B and F (highest to lowest) for potential risk of adversely impacting fisheries and aquatic habitat.

Effects from Recreation Management - Recreational use can have significant adverse effects on fish and aquatic habitat. Sport fishing is a major recreational activity on the Forest, but a variety of other recreational uses, such as motorized vehicle use, boating, hiking and horseback riding, can all damage riparian and aquatic habitats. Generally speaking, those alternatives that emphasize nonmotorized recreation would have less risk of adversely affecting fish and aquatic habitat.

Alternative F has the most acres allocated to nonmotorized recreation, including wilderness, followed by Alternatives B, D, C, A, G, and E.

The projections of recreation fishing days for both the short-term and long-term showed no significant differences between the proposed alternatives.

Effects from Timber Management - Timber harvest and related road construction and reconstruction affect fish and aquatic habitat in a variety of ways. These direct and indirect effects for both the short term and long term were previously described and disclosed in Tables 3-23 and 3-24.

Effects from Vegetation Management - Vegetation, and particularly riparian vegetation, regulates the exchange of nutrients and organic material from upland forests and grasslands to streams. Vegetated riparian areas are particularly dynamic portions of the landscape. These areas are shaped by disturbances characteristic of upland ecosystems, such as fire and windthrow, as well as by disturbance processes unique to aquatic systems, such as channel erosion, peak flow, deposition by floods, and debris flows.

Riparian areas are widely considered to be critical habitat for fish and aquatic insects. Maintaining the integrity of the vegetation is particularly important for these riparian-dependent species.

There are approximately 51,600 acres of riparian habitat currently on the Forest. Under all alternatives, these acres would be managed to protect streambank stability and provide cover and habitat for fish and aquatic insects. Vegetative management projects implemented under any of the proposed alternatives would be designed to protect fish and aquatic habitat. All alternatives would require best management practices (BMPs) to be followed.

Effects from Wildlife Management - Generally, wildlife management projects would be expected to improve or have no effect on fish and aquatic insect habitat. Wildlife habitat improvement projects such as willow burning and pruning would improve riparian vegetation for fish and aquatic insects as well.

Site-specific project proposals would include an analysis of the effects to the aquatic ecosystem and require appropriate mitigation measures. No differences would be anticipated among the alternatives.

Cumulative Effects

Multiple timber harvest in sensitive watersheds, in combination with other forest management activities, such as grazing, minerals management and road management, could result in adverse aggregate cumulative effects to fish and aquatic habitat. The incremental increases in sediment yield from Forest Service and other management activities could cumulatively affect stream channel stability, riparian vegetation, and ultimately fish populations.

Generally speaking, alternatives proposing construction or reconstruction of the largest number of road miles would have the highest potential risk of creating adverse cumulative effects to the fisheries resource in watersheds currently rated sensitive from past related and unrelated activities. This would include effects to both Forest and off-Forest streams. Alternative E proposes the most miles of road, followed by G, A, D, C, B, and F at the full budget level.

When combined with the effects of other off-Forest projects, dams and water diversions can contribute to downstream dewatering and affect fish and fish habitat, including threatened and endangered species.

Two considerations are important when considering the effects of the proposed alternatives on fish and aquatic habitat. First, there may be other contributing factors such as recreational overharvest, diseases, and hatchery practices that are responsible for fish population fluctuations. Secondly, the standards, guidelines and mitigation measures proposed for protection on Forest Service lands will not necessarily address or correct problems originating on downstream lands administered by other agencies or in private ownership.

Insects and Disease

Introduction

Refer to Appendix D (Biological Diversity Report) for descriptions of the most prevalent insects and diseases on the Forest and their role in ecosystems.

Engelmann spruce is affected primarily by spruce beetle (Dendroctonus rufipennis). Lodgepole pine is affected primarily by the mountain pine beetle (Dendroctonus ponderosae) and dwarf mistletoe (parasitic plants). Armillaria root disease has been observed on lodgepole pine, ponderosa pine, and subalpine fir, but is of minor concern on the Forest. Comandra blister rust has also been observed on lodgepole pine and ponderosa pine but is also of minor concern.

Control of insects and disease has occurred primarily with the salvaging of dead and dying trees and the suppression of damaging levels of insect and disease populations. Stand management is now regarded as a way to develop stands that are much more resistant to attacks by insects and disease. Therefore, the amount of forested land that may be more susceptible to insects and disease is directly related to the absence of management.

Insects and disease contribute to disturbance processes in the forested ecosystem. They are fairly widespread over the Forest and act over long periods of time. Insects and disease, along with wildfire, have been viewed as having negative influences on the Forest. This will still be the case where management objectives conflict with insect and disease outbreaks. However, where management objectives recognize these outbreaks as part of the "natural" disturbance processes in the Forest, they are considered to be beneficial to the Forest's cycles of growth and decline and necessary to the maintenance of the Forest.

The long range goal of insect and disease management within management area prescriptions 5.11, 5.13, and 5.21 is prevention and suppression through silvicultural treatment of susceptible stands. In general, timber management activities that increase stand vigor will usually decrease stand susceptibility to insects or disease.

It is extremely difficult to determine the probability of insect and disease activity with any accuracy. The greatest problem of forecasting epidemics and outbreaks is the lack of historical data. There can be a large combination of factors or sequence of events (weather or climate, succession in vegetation ages and species, epidemic levels of insects and disease) that affect these disturbances.

Legal and Administrative Framework

- **Code of Federal Regulations 36 CFR 219.16(a) (2) (iii)** - This regulation allows for the harvesting of stands of timber that have not reached CMAI (Culmination of Mean Annual Increment) "which are in imminent danger from insect or disease attack."

- **Code of Federal Regulations 36 CFR 219.27** - This section of the regulations sets the minimum specific management requirements to be met in accomplishing goals and objectives for the National Forest System. 36 CFR 219.27(a) (3) requires that all management prescriptions utilize principles of integrated pest management to prevent or reduce serious, long lasting hazards and damage from pest organisms, consistent with the relative resource values involved. 36 CFR 219.27(c) (2) discusses the ASQ (allowable sale quantity) and states: "Nothing in this paragraph prohibits salvage or sanitation harvesting of timber stands which are substantially damaged by fire, windthrow, or other catastrophe, or which are in imminent danger of insect or disease attack and where such harvests are consistent with silvicultural and environmental standards."

Key Indicators

- Acres infected with dwarf mistletoe by severity classes.
- Acres infested with mountain pine beetle and acres with mountain pine beetle risk rating.
- Acres infested with spruce beetle and acres with spruce beetle risk rating.
- Acres of suitable land available for timber management.
- Acres of management area prescriptions in which timber management is emphasized.

Resource Protection Measures

Resource protection is accomplished through forest-wide and management area prescription standards and guidelines. Sanitation and salvage sales may be used to suppress insect and disease activity where necessary and allowed.

Affected Environment

Management area prescription designation will greatly influence the impacts of insects and disease activity. For example, alternatives with more suitable acres for timber production will have more vegetative management activities and less risk of large-scale mortality due to insect and disease outbreaks. Increases in wilderness designations will result in greater risk of large-scale insect and disease outbreaks within these areas. Insect and disease outbreaks are considered as more of a natural event in wilderness.

Effects of insects and disease will be viewed differently for each management area prescription, depending on the objectives for the prescription. All forested land will be affected to some degree. Areas having the most effects from insect and disease management will occur in management area prescriptions 5.11, 5.12, 5.13, and 5.21. Timber management and silvicultural treatments will be used to reduce the potential for insects and disease outbreaks in these areas. In all other management area prescriptions, there will be some degree of acceptance or limits to the amount of natural

insect and disease disturbance allowed due to the management objective for the areas and the severity of the incidence at that time. Case-by-case analysis will need to be made on a project level to determine action or no action. Two geographic areas, Troublesome and Middle Yampa, might require special consideration for harvesting due to insect or disease outbreaks. These special considerations are outlined in Chapter 2 of the Plan (Management Area 1.32, Vegetation Standard 1), and Chapter 3 of the Plan (Troublesome and Middle Yampa Geographic Areas). Appendix D also contains information about insects and disease.

Environmental Consequences

General Effects

For those stands inventoried on the Forest, ratings have been developed for beetle risk in spruce/fir stands and lodgepole stands to display the possibility of future beetle infestation. A mistletoe rating indicating the severity of mistletoe infection has also been developed. The rating corresponds to the expected risk of each infestation.

Dwarf mistletoe surveys in lodgepole pine have been completed for approximately 182,590 acres on the Forest. This is about 13% of the Forest and 48% of the lodgepole pine cover type. Of the acres inventoried, about 80% have a low infection rating, 10% have a medium infection rating, and 10% have a high infection rating.

Mountain pine beetle risk ratings have been computed for 107,465 acres on the Forest. This is about 8% of the Forest and 28% of the lodgepole pine cover type. Of these acres inventoried, approximately 10% have a low rating, 70% have a medium rating, and 20% have a high rating.

Spruce beetle ratings have been computed for about 141,740 acres on the Forest. This is 10% of the Forest and 31% of the spruce/fir cover type. Of these acres inventoried, approximately 30% have a low rating, 60% have a medium rating, and 10% have a high rating.

This inventory data represents the forested area in which timber harvests will occur. Most of the forested area has medium risk for the mountain pine beetle, medium risk for the spruce beetle, and low intensity for dwarf mistletoe infections. This indicates that at the present time, considering no major changes occur in climate, susceptibility to insects and disease is not severe. However, as these stands become older, they will become more susceptible to insects and disease attacks. If large scale climatic changes occur, especially droughts, susceptibility to insect and disease damage will increase.

Direct and Indirect Effects

Effects from Fire Management - In wilderness, future decisions may allow wildfires to run their course. This will decrease the susceptibility of older stands to insects and disease. However, decisions will be determined on a case-by-case basis.

In other management area prescriptions in which timber harvest does not occur, fire suppression has allowed stands to increase in age and fuels to build up. This has decreased the vigor and growth of the stands. All these factors increase stand susceptibility to insect and disease outbreaks. The objectives of the management area prescriptions will determine whether the outbreaks will be allowed to continue.

Effects from Timber Management - Timber harvesting and timber stand improvement provides an opportunity to implement an ecological approach for the prevention or reduction of serious pest outbreaks. Harvesting trees provides an opportunity to remove

diseased and high-risk trees. On clearcuts and other final harvest sites, opportunities for long-term protection and prevention of insect and disease outbreaks and restoration of forest health can be managed. Stands most susceptible to insect damage and most infected with mistletoe can be harvested and replaced with mistletoe-free young stands that are much less susceptible to insect damage. In stands scheduled for overstory removal, shelterwood, or uneven-aged management, individual suppressed or dying trees can be removed, thus increasing the overall growth and vigor of remaining trees. In commercial and precommercial thinning operations, susceptibility to insects and disease will be decreased by increasing the growth and vigor of the remaining trees.

Impacts from insect or disease outbreaks are directly related to the amount of land on which vegetation manipulation will occur. Alternatives B and F have the least amount of suitable acres within the 5.11 management area prescription and no acres allocated to management area prescriptions 5.12 or 5.13. Consequently, these alternatives offer fewer opportunities to treat forest land with timber management activities. In Alternatives A, C, D, E and G, suitable acres and timber harvest treatment opportunities are greater. As the age classes and interspersion of tree species become more varied over time, the risk of wildfire, insects, and disease will decline under these alternatives.

Table 3-31 shows the amount of harvest acres by alternative at the desired condition and experienced budget levels for the first decade. Values for decade five increase slightly in all alternatives due to the addition of second- and third-step shelterwood cut volumes but do not affect the ranking shown below.

Table 3-31. Harvest Acres by Alternative for the Desired Condition Level (DCL) and Experienced Budget (EBL) Levels in Management Area Prescriptions 5.11, 5.13 and 5.21

	A	B	C	D	E	F	G
Decade 1 DCL	25,530	11,560	17,190	17,830	28,500	5,200	24,970
Decade 1 EBL	12,940	8,930	11,260	11,560	13,140	5,200	13,400

Source: FORPLAN

Alternative A corresponds to conditions within the 1983 Plan. Harvest acres include areas harvested by clearcut, coppice, shelterwood, and selection treatments.

The amount of land in which susceptibility to insect damage decreases and/or where mistletoe infections are eliminated directly corresponds to the amount of land that will be harvested. Therefore, if the alternatives are ranked by the amount of timber harvest treatment acres, the ranking, from most to least beneficial, is as follows for the experienced budget level: G, E, A, D, C, B, and F.

The ranking of alternatives by the desired condition budget level is as follows: Alternatives E, A, and G are the most beneficial, with little difference between them. They are followed by Alternatives D, C, B, and F.

Effects from Wilderness Management - In management area prescriptions 1.11, 1.12, and 1.13, all acres will remain the same in all alternatives. In management area prescription 1.2 (recommended wilderness), there are acres recognized for Alternatives B, D, and F. Susceptibility to insects and disease within the proposed wilderness areas would increase with increased wilderness designation.

Effects from Recreation and Travel Management - Unless exotic or nonnative insects or disease are brought into the Forests from people recreating on the Forest, there should be no effects to insects or disease from recreation or travel management.

Cumulative Effects

By suppressing wildfire, we have increased the acres that will age into later successional stages of vegetation and increased the probability of insect and disease outbreaks. The number of shade tolerant species will increase. These changes will occur over very long periods of time and will not be readily noticeable.

This can be offset somewhat by management of lands for the purpose of timber production. However, changes to vegetation over forested lands within these management areas will be gradual. Large amounts of older stands will still have to be held over for sustained yield and harvested in later years due to restrictions on harvest acres by decade. Eventual changes to diversity by timber management will decrease the risk that any one insect or disease will have catastrophic impacts. Where these impacts occur in the future, salvage operations will be made in management areas where this is allowed.

Lands adjacent to wilderness may be affected. If insect and disease outbreaks occur within wilderness areas or other areas receiving little or no management, they may spread from these areas to areas managed for other resources and threaten the management objectives of the other areas. Decisions to suppress the outbreaks, to initiate salvage operations where allowed, or to allow the outbreaks to continue will have to be made on a case-by-case basis. This will also affect management activities on lands adjacent or close to wilderness areas.

Data from inventoried land (primarily within the 5.11, 5.13, and 5.21 management area prescriptions) show that approximately 51% of those acres originated between 1850 and 1910 (approximate period of settlement). Refer to figure D-10 in Appendix D. Major insect and disease outbreaks are not expected to occur during the next 10 year plan period and perhaps not for 10 to 20 years. However, as the Forest ages, the susceptibility to insect and disease outbreaks will greatly increase, and the amount of timber harvest in any of the alternatives will not significantly reduce the amount of susceptible acres in the future. Even the highest amount of timber harvest in any of the alternatives will not significantly change the amount of acres in late successional stages of forest vegetation (which are more susceptible to insects and disease). Therefore, it is reasonable to assume that the occurrence and severity of insect and disease outbreaks will increase with time. The timing and/or severity of these outbreaks cannot be predicted, nor is it possible to predict the vegetation management activity that might decrease or stop these outbreaks.

There are no historical records showing the distribution of vegetation age and/or size classes across the Forest prior to the settlement period. Without information of this type, it is impossible to determine the range of natural variability for these elements.

Vegetation

Introduction

The ecosystems and associated vegetation of the Routt National Forest are very dynamic. The processes of succession and associated disturbance patterns have produced the current vegetative conditions. These natural processes, both part of and necessary for ecosystem function, will continue to produce changes in the future. Therefore, the following description of current vegetation represents one point in time. Some of the changes will be generally predictable, others less so. Accordingly, any description of future vegetation will be a prediction subject to uncertainty. The level of uncertainty depends on the degree to which natural processes are allowed to operate. Natural disturbance events such as fire, wind storms, landslides, and insect and disease outbreaks are generally difficult to predict. On the other hand, changes associated with succession and human-caused disturbance such as logging and prescribed burning are fairly predictable. Although natural disturbance events will occur throughout the Forest, the degree to which they are allowed to occur will greatly influence the ability to predict future vegetative conditions at any given point in time.

Legal and Administrative Framework

- National Forest Management Act of 1976 (NFMA)
- Code of Federal Regulations (CFRs) 36
- 217 Requesting Review of National Forest Plans and Project Planning
- 219 Planning
- 221 Timber Management Planning
- 222 Range Management

Policy direction from the Forest Service Directives System in Forest Service Manuals (FSM) 2400 Timber Sale Management and 2200 Range Management, and in Forest Service Handbooks (FSHs) as listed here but not limited to:

- 2209 Various Handbooks relating to Range Management
- 2409.13 Timber Resource Planning Handbook
- 2409.14 Timber Management Information System Handbook
- 2409.15 Timber Sale Administration Handbook
- 2409.17 Silviculture Practices Handbook
- 2409.18 Timber Sale Preparation Handbook
- 2409.26 Silvicultural Practice Handbook
- 2409.26b Reforestation Handbook
- 2409.26c Timber Stand Improvement Handbook

Key Indicators

- Natural disturbance levels.
- Restricted grazing allocations.
- Acres, types, and rotation length of timber harvest.
- Acres in different structural stages.
- Noxious weed infestation.

Resource Protection Measures

The Revised Plan contains numerous forest-wide and management area prescription standards and guidelines concerning vegetation. Additional guidelines are also established for several Geographic Areas.

All alternatives provide for satisfactory regeneration of logged areas, for treatment of activity related fuels, and various wildland fire management strategies needed for resource protection.

Affected Environment

Composition

Vegetation on the Forest has been classified into several types, including both forest and nonforest types. The descriptive names used are based on the major species found in the type. Many species, other than those listed, also occur in each type. Cover types for the Forest, their acreages, and the percent of the total Forest are listed in Table 3-32.

Table 3-32. Percent of Cover Types on the Routt National Forest (acres rounded to hundreds)

Cover type	Acres	Percent of Total
Engelmann spruce/subalpine fir	454,000	33.4
Lodgepole Pine	379,100	27.9
Aspen	260,400	19.2
Grass/forb	117,700	8.7
Shrubs	68,600	5.1
Nonvegetated	53,700	4.0
Water/wetland	17,900	1.3
Douglas-fir	5,300	.4

Source: GIS (DWRIS)

Major Cover Types of the Routt National Forest

Engelmann spruce/subalpine fir

Engelmann spruce and subalpine fir are the dominant overstory species in this type. The mixture of these two species and presence of other overstory species varies. Both Engelmann spruce and subalpine fir can reproduce in their own shade. Consequently, this type is considered climax for much of the Forest. These forests often form multi-aged stands. In addition, the ability to grow in their shade produces trees with live branches reaching a great distance down the trunk (Alexander and Engelby, 1983).

Lodgepole pine

Lodgepole pine is the dominant overstory tree in this type. Forests of this type may also contain other overstory species but always in a minority. Lodgepole pine has difficulty reproducing in shade and so this type is referred to as a seral stage in succession. Thus, given a long enough period of time, they are often replaced by the climax type, Engelmann spruce/subalpine fir. Lodgepole forests are generally even-aged, with live branches confined to the upper trunk (Alexander et al. 1983).

Aspen

Aspen makes up the majority of overstory trees in this forest type. Conifer species are often present in varying degrees in both the overstory and understory. In the Rocky Mountain Region, aspen generally do not reproduce by seed but rather by clonal suckering (root sprouts). Aspen do not reproduce easily in their own shade and tend to be short lived. Thus, these seral forests are often replaced by conifer forests. There are some aspen areas on the Forest that are climax. However, most of this forest type generally require some disturbance in order to be maintained. Historically, fire was the disturbance event responsible for aspen regeneration. Aspen forests also have an abundance of grasses and forbs in their understory (Shepperd and Engelby 1983, Hoffman and Alexander 1980).

Grass/forb

Grasses and forbs of various types are the dominant species along with various numbers of shrub and tree species. This type is generally limited to the alpine tundra found in the higher mountains on the Forest.

Shrubs

Shrubs dominating these areas include Gambel oak, sagebrush, and willow. They may be climax or seral, depending on environmental factors. Gambel oak and sagebrush are found at lower elevations on drier sites. Many of these type require some disturbance in order to reproduce. In the past, fire has served as the disturbance agent.

Nonvegetated

Areas in which vegetation does not exist or is very sparse are classed as nonvegetated. Talus, rock outcroppings and snow fields are included. These areas are usually not capable of producing vegetative cover under current climatic conditions.

Water/wetland

Wetland vegetation is a special grouping (see Chapter 3 - Water/Riparian/Wetlands).

Douglas-fir

The Douglas-fir type is dominated in the overstory by Douglas-fir. Other tree species may be present in smaller percentages. Douglas-fir seedlings can tolerate shade, but the species prefers full sunlight. This type is usually seral, but can be climax under the right environmental conditions. Thick bark on older trees makes them more resistant to fire than most of the species it is associated with on the Routt. The forest can be multi-aged or even-aged. (Hermann and Lavender 1990)

Structure

Structure is the physical organization of the vegetative component. The discussion here will focus on vertical, and to some degree horizontal, structure.

Vertical structure will be measured by habitat structural stage. As a forest grows, it passes through a series of structural stages corresponding to the average size of the trees. These stages and corresponding tree sizes are defined in Table 3-33. In addition, structural stages 3 and 4 are subdivided into three groups corresponding to crown cover. These subgroups and corresponding crown closure classes are:

a. 11 to 40% crown cover.

b. 41 to 70% crown cover.

c. 71 to 100% crown cover.

Table 3-33. Habitat Structural Stage Descriptions

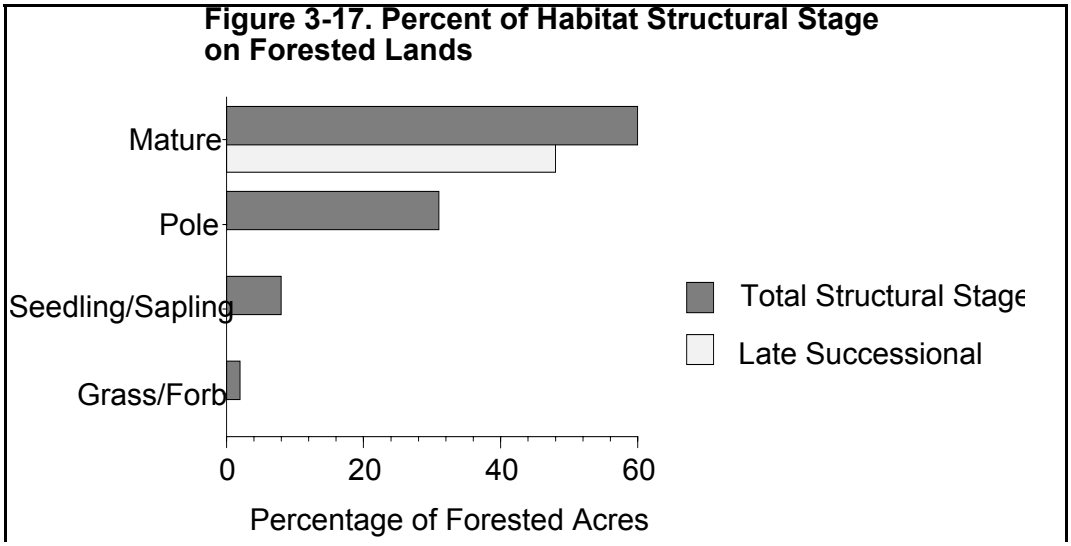
Structural Stage Number and Name		Description
1	Grass/forb	Nonstocked with trees
2	Seedling/sapling	Trees < 1 inch in diameter
3	Pole	Trees 1 to 9 inches in diameter
4	Mature	Trees > than 9 inches in diameter
5	Old Growth	Based on score card system and Mehl (1992), includes size, # species, snags, dead & down logs, canopy cover

Source: Rocky Mountain Resource Information System (RMRIS) data dictionary

Accordingly, there are nine potential habitat structural stages. The inventory and use of structural stage 5 on the Forest was recently initiated. Consequently, the data available is limited and not useful for forest-wide summaries and analyses. However, according to the description of old growth proposed by Mehl (1992), structural stage 4 stands on the Forest could qualify as old growth. Therefore as discussed in Appendix D, structural stages 4b, 4c, and 5 will be grouped together as potential old growth or late successional forest and are a suitable measure for assessing effects. With a crown cover of 11 to 40%, structural stage 4a stands are too open to be considered for this analysis.

Figure 3-17 shows the percent of total forested acres by structural stage. Sixty-one percent of the Forest is considered mature forest, structural stage 4. Of the remaining areas, about 1% is structural stage 1; 3% is structural stage 2; 35% is structural stage 3. Forty-nine percent of the Forest is in structural stages 4b, 4c, and 5 (late successional). Table 3-34 shows how structural stage acreage is distributed by cover type.

Figure 3-17. Percent of Habitat Structural Stage on Forested Lands



Source: GIS (Arc/Info)

Table 3-34. Acreage and Percent Structural Stage by Cover Type										
	Structural Stage									
Cover Type	**1**		**2**		**3**		**4**		**4a, 4b, 5 Late Successional**	
	Ac	Pct	Ac	Pct	Ac	Pct	Ac	Pct	Ac	Pct
Spruce/fir	4,595	1.0	6,183	1.4	123,045	27.1	320,154	70.5	254,317	56.0
Lodgepole pine	5,507	1.5	15,688	4.1	138,642	36.6	219,260	57.8	180,132	47.5
Aspen	4,378	1.7	5,077	2.0	125,439	48.2	125,470	48.2	101,616	39.0
Douglas-fir			69	1.3	1,406	26.3	3,861	72.4	2,939	55.1

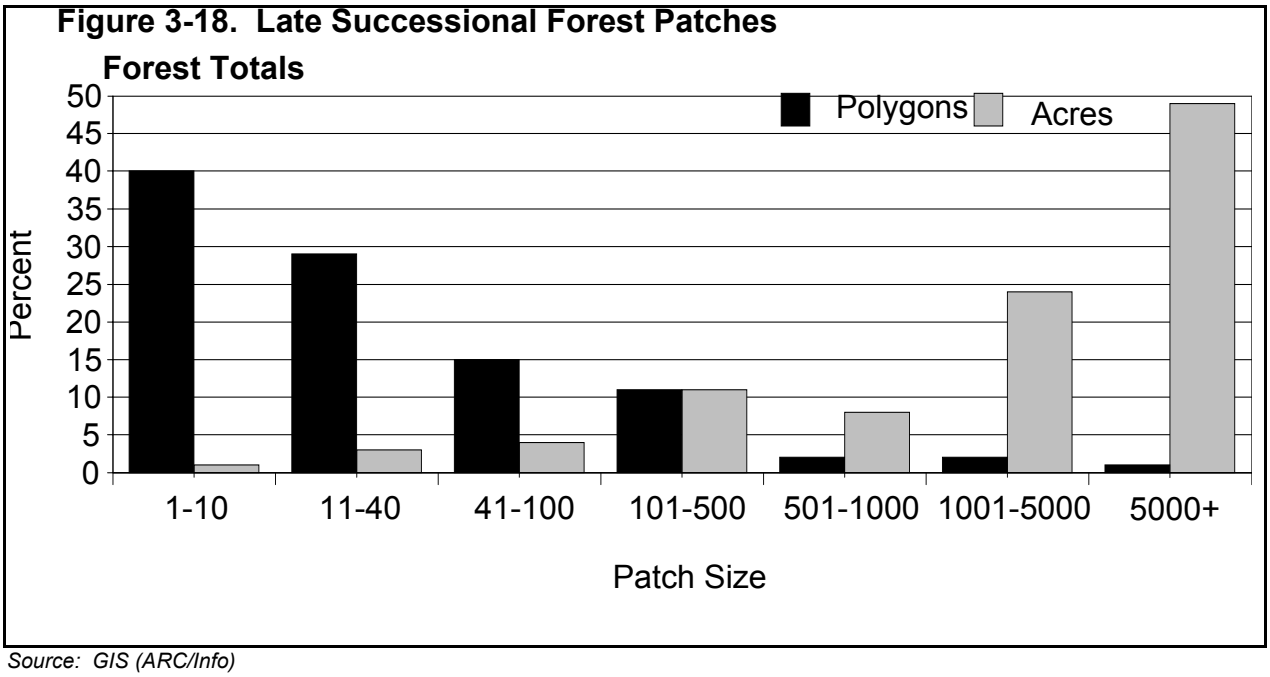
Source: GIS (DWRIS), vegetation layer

Horizontal structure will be addressed through the use of late successional forest patch size. Late successional patches are defined as connected late successional forest stands of all cover types. This analysis is fully described in Appendix D. Table 3-35 and Figure 3-18 describe these patches for the entire Forest. There are many more small patches than there are large patches. But the bulk of the acreage is in large patches.

Table 3-35. Late Successional Forest Patch Size Statistics - Forest Totals		
Average	**Percent in Patches over 500 acres**	**Percent in Patches over 5000 acres**
213.7	81	49

Source: GIS (ARC/Info), vegetation layer

Figure 3-18. Late Successional Forest Patches



Source: GIS (ARC/Info)

Function

Ecosystem functions deal with energy and material flows within and between ecosystems. Accordingly, ecosystem functions are closely tied to ecosystem processes. Ecosystem processes cause composition and structure to change with time. Conversely, changing composition and structure leads to a change in the processes. It then follows that ecosystem functions are also very dynamic, changing over time. Specifically, the functions associated with vegetation are quite complex. For example, nutrient cycling and photosynthetic production change in relation to composition and structure. However, the discussion of function regarding vegetation will focus on the function of vegetation as species habitat. This aspect of function is associated with habitat structural stage. For example, a stand-replacing fire in lodgepole pine might move the stand from a structural stage 4b to 1. A late successional forest (structural stage 4b) has very different habitat characteristics than an opening (structural stage 1). This aspect of function is analyzed and discussed in the wildlife section.

Noxious Weeds

Noxious weeds exist in small intrusions throughout various native vegetative cover types. Noxious weeds are predominately non-native species that have been introduced through many means into the native ecosystems. The most common noxious weeds found on the Routt National Forest are Canada thistle, field bindweed, whitetop, yellow toadflax, musk thistle, spotted knapweed, tarweed, and houndstongue.

Noxious weeds are most commonly found in areas where ground-disturbing activities have occurred and where noxious weed seed sources frequently occur. Areas where noxious weeds are expected to occur in higher densities are road systems, livestock impacts areas such as corral sites and trails, timber harvest areas, campgrounds,

recreation trails and trailheads, utility corridors, water transportation ditches, and stream systems.

Environmental Consequences

General Effects

The composition and structure of the Forest will continue to be influenced by the same succession and disturbance processes that shaped it. Accordingly, the vegetation will change with time. Natural disturbance events and succession will continue to operate regardless of the alternative. Implementation of any given alternative will influence vegetation by the degree to which natural disturbance events are allowed to operate and according to the levels of various human-caused disturbance events, such as logging and grazing.

Succession will continue to move vegetation toward a climax condition. In general, this means spruce/fir acreage will increase at the expense of lodgepole pine and, to some extent, aspen. Aspen may also be replaced with lodgepole pine. Other communities will also move toward their climax condition. However, both natural and human-caused disturbance processes will influence succession on the Forest. The degree to which succession is influenced depends in large part on the magnitude and type of disturbance. Composition resulting from the interaction between succession and natural disturbance is difficult to predict in anything but general terms.

As the forest continues to grow, individual forest communities will gradually move into the more mature structural stages. Acreage in structural stage 4 will correspondingly increase as the acreage in structural stages 1, 2, and 3 decreases. This maturation will be accompanied by an increase in crown cover. As a result, the acreage in crown closure classes b and c will also increase in both structural stages 3 and 4. Consequently, total acreage in late successional forest, structural stages 4b, 4c, and 5 will increase with time. Once again, disturbance processes will play a major role in determining future forest structure. When major disturbance events occur, the disturbed area will move into another structural stage. Many of these areas may go to a structural stage 1 or 2.

Direct and Indirect Effects

Effects from Fire Management/Insect and Disease Management - Fire management and insect and disease management are analyzed together because they fall into the broad category of natural disturbance events. In Table 3-36, the management area prescriptions used in the alternatives are grouped into three broad categories based on the degree to which natural disturbance events are accepted.

Table 3-36. Management Area Prescription Natural Disturbance Levels

Natural Disturbance Limited	Some Natural Disturbance Allowed	Natural Disturbance Accepted
2.1	1.32 (Alternative C- Middle Yampa and Troublesome Geographic Areas)	1.11
3.23	1.5	1.12
4.2	3.21	1.13
4.3	3.31	1.2
5.11	3.4	1.32 (most)
5.12	3.55	1.41

5.13	5.41	2.2
5.21		
7.1		
8.22		
8.3		

In the first group (natural disturbance limited), management will attempt to control major natural disturbance events. Management in the second group (some natural disturbance allowed) will be compatible with some major natural disturbance depending on individual management area prescription objectives. The third group (natural disturbance accepted) includes areas in which major natural disturbance events are compatible with management objectives.

In management area prescription 5.13 (Forest Products), the emphasis is on the production of wood products. Wildland fires will be controlled through direct or perimeter control in this management area, and insects and diseases will be limited through stand management. Thus, management area prescription 5.13 was placed into the first group, disturbance limited. On the other hand, management area prescription 3.31 (Backcountry Recreation Motorized) was placed into the second group, some disturbance allowed. Vegetation in this area will be managed for a natural appearance and to promote overall biological diversity. This would include a wildland fire prescription control strategy. However, where fire might interfere with recreation opportunities, the control strategy could also be perimeter control. In management area prescription 2.2 (Research Natural Areas) disturbance is accepted. These areas are to be managed as natural functioning ecosystems including natural disturbances. However, each situation must be evaluated on an individual basis.

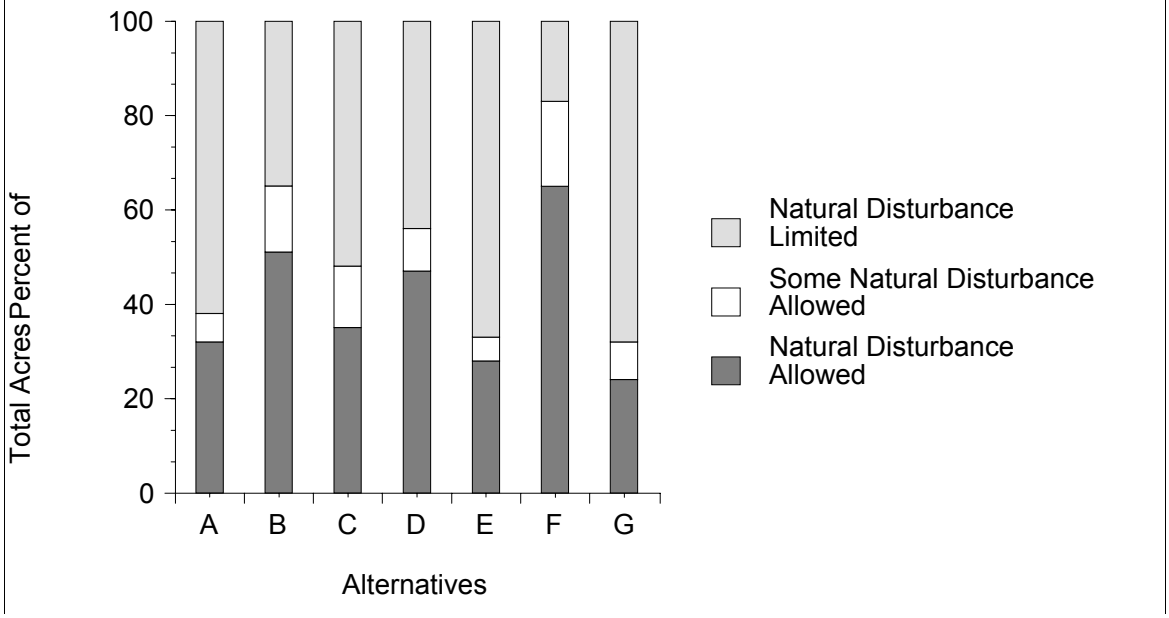
Table 3-37 displays the acreage in each of the alternatives that falls into the three natural disturbance level groups. Figure 3-19 displays this graphically. As Table 3-37 shows, Alternatives A, C, E, and G have a higher percentage of acres in the disturbance limited group. Alternatives B, D, and F have a higher percentage of their acres in the disturbance accepted group. In Alternatives C and D, the acreages in disturbance limited and disturbance accepted are closer to each other than in the other alternatives.

Table 3-37. Natural Disturbance Level Acreage and Percentage by Alternative

Alternative	Natural Disturbance Limited		Some Natural Disturbance Allowed		Natural Disturbance Allowed	
	Acres	Percent	Acres	Percent	Acres	Percent
A	848,800	62%	82,900	6%	426,900	32%
B	475,000	35%	196,600	14%	687,000	51%
C	708,800	52%	173,100	13%	476,600	35%
D	599,700	44%	122,700	9%	636,200	47%
E	910,500	67%	74,300	5%	373,800	28%
F	232,500	17%	244,800	18%	881,300	65%
G	924,700	68%	112,500	8%	321,400	24%

Source: GIS (ARC/Info), allocation layers

Figure 3-19. Natural Disturbance Levels by Alternative



Source: GIS (ARC/Info)

As disturbance events begin to occur in the disturbance accepted areas and to a lesser degree in some disturbance allowed areas, composition and structure of the vegetation will begin to show the effects. Exactly how composition and structure will be affected in the future cannot be predicted with certainty. However, insect and disease outbreaks generally have a higher probability of occurrence in stands of higher density (see Insect and Disease section of this document). The Range of Natural Variability Study (Routt National Forest 1994) identified the fire return interval in spruce/fir as 200 years,

lodgepole pine as 200 years, and aspen as 70-100 years. The stand turnover rates related to fire were found to be 500 years in spruce/fir, 300 years in lodgepole pine, and 200 years for aspen. The stand turnover rate is the mean length of time required for fire to revisit a stand. The return interval is the length of time required for fire to revisit an area. As a result, the chances of a natural disturbance event occurring (insect/disease outbreak or major stand-replacing fire), increase in older more dense forests. These aspects of natural disturbance risk give some idea of the probabilities involved. The areas in a mature structural stage have a higher probability of a major disturbance occurring, along with the associated change in composition and structure. To some degree, these areas will become more diverse due to natural disturbance events. In areas where natural disturbance will be limited by management action, this disturbance has a much lower probability of influencing composition or structure.

Effects from Range Management - Each alternative allows livestock grazing to different degrees. Table 3-38 breaks the management area prescriptions into three categories based on the manner in which they address grazing. In the first group, grazing is generally allowed with only standard restrictions. The second group imposes some additional restrictions based on management area objectives. The final group has restrictions ranging from no grazing for management area prescription 2.2 to a 30% utilization restriction for prescription 1.41, with grazing phased out entirely over the long term.

Table 3-38. Management Area Grazing Restriction Levels

Standard Restrictions	Additional Restriction According to Management Objectives	Restricted Grazing
1.11	1.5	1.41
1.12	2.1	2.2
1.13	3.21	
1.2	3.23	
1.32	3.4	
3.31	3.55	
4.2	4.3	
5.11	5.41	
5.12		
5.13		
5.21		
7.1		
8.22		
8.3		

Grazing is a disturbance agent to the herbaceous cover. Its exact effect on succession depends on a number of factors, including the level of grazing, timing, seral stage of the area, and other environmental parameters. Grazing by wildlife will have similar effects. Table 3-39 shows the acreages included in these three groups and the percentages of total National Forest System land. Livestock grazing will have a greater effect in the alternatives with a larger percentage of land allocated to grazing. From high to low, the alternatives ranked by acres in the generally no restriction category are A, E, C, D, G, B, and F.

Table 3-39. Grazing Restriction Level Acreage and Percentage by Alternative						
	Standard Restrictions		Restriction Related to Objectives		Restricted Grazing	
Alternative	Acres	Percent	Acres	Percent	Acres	Percent
A	1,237,200	91%	120,800	9%	600	<1%
B	1,145,400	84%	143,100	11%	70,100	5%
C	1,163,600	86%	163,600	12%	31,400	2%
D	1,162,900	86%	125,600	9%	70,100	5%
E	1,183,800	87%	104,700	8%	70,100	5%
F	751,300	55%	254,600	19%	352,700	26%
G	1,153,300	85%	135,200	10%	70,100	5%

Source: GIS (ARC/Info), allocation layers

Effects from Recreation - Recreation is expected to increase for all alternatives. Winter recreation, including snowmobiling and skiing, compact snow and slow melting in the spring. This in turn can have an effect on vegetation under or near the areas of compaction (Keddy et al., 1979). Snowmobiles and, to a lesser degree, skiers can also cause physical damage to trees not covered by the snow pack. Summer recreation can also effect vegetation. Trampling associated with trails and campsites causes physical damage to plants as well as longer term compaction to the soil resource (Cole and Knight 1990). Soil compaction can in turn affect vegetation in term of species composition and growth rates. In general, the effects from recreation described here occur in isolated areas of heavy use and are most effectively addressed at the site-specific project level.

Effects from Threatened, Endangered, Sensitive Species Management - Management of threatened, endangered and sensitive (TES) species will have a consistent effect on vegetation for all alternatives. In general, the habitat requirements in and around each known or discovered TES location will be protected, restored, or enhanced.

Effects from Timber Management - The effects of timber management on the vegetation will be limited to management area prescriptions 5.11, 5.13, and 5.21. These are the only management area prescriptions in which the vegetation will be specifically managed for the production of wood products. For the most part, timber management will not change the cover type of an area. Occasionally, the cover type may change due to the silvicultural prescription applied, but these cases will be the exception. Timber management will, however, have an effect on structure. Table 3-40 shows the total number of acres harvested in management area prescriptions 5.11, 5.13, and 5.21. The alternatives with a greater number of acres treated will have a greater effect on structure. The alternatives ranked by effects on structure from greatest to least for the experienced budget level are G, E, A, D, C, B, and F. This is true for both decades 1 and 5. At the full implementation level, alternatives are ranked E, A, G, D, C, B, and F.

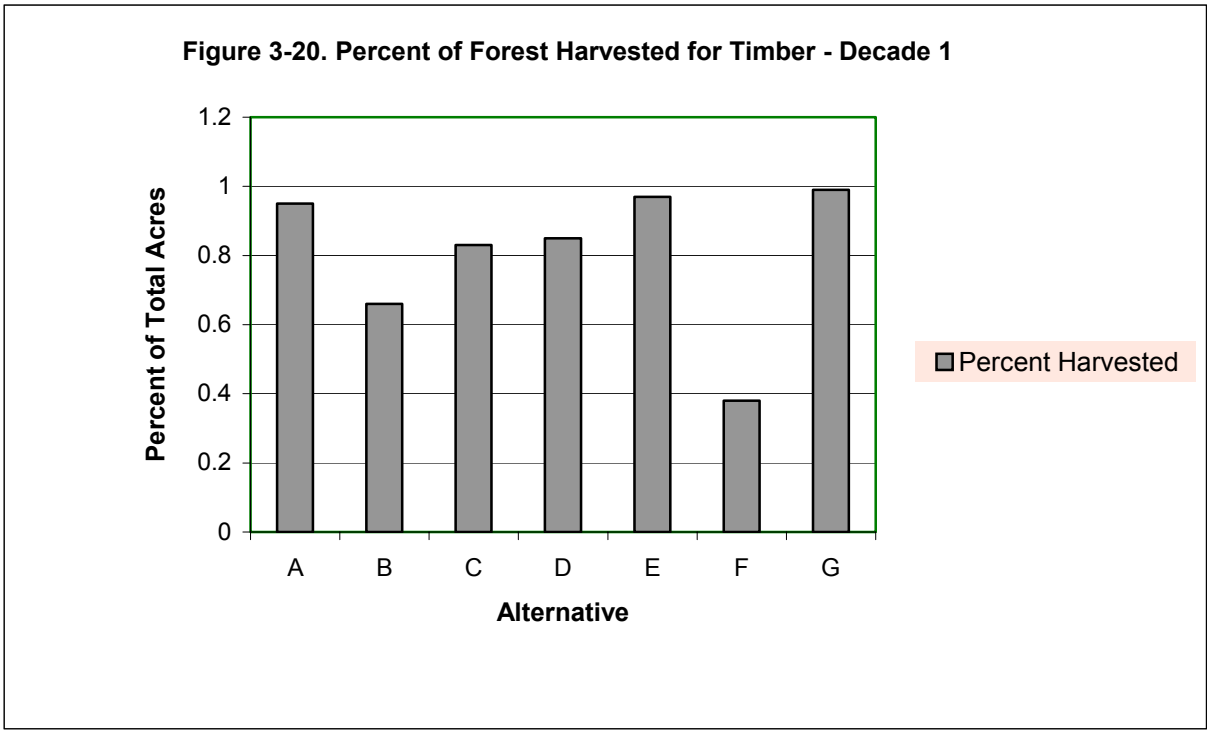
Table 3-40. Acres Of Timber Harvest By Alternative							
	A	B	C	D	E	F	G
Experienced Budget Level-	12,937	8,929	11,257	11,561	13,140	5,197	13,398

Acres Treated Decade 1							
Experienced Budget Level - Acres Treated Decade 5	13,871	8,507	12,321	12,464	14,101	8,207	14,491
Full Implementation Level - Acres Treated Decade 1	25,532	11,559	17,194	17,829	28,500	5,195	24,969

Source: Routt FORPLAN Model

Figure 3-20 shows the percent of the Forest harvested for timber for the first decade at the experienced budget level. Specific changes to structure in a given area depend on site-specific individual conditions and the silvicultural prescription applied.

Figure 3-20. Percent of Forest Harvested for Timber - Decade 1



Source: FORPLAN

Silvicultural prescriptions and their application to cover types on the Forest are discussed in Appendix G. Table 3-41 shows the FORPLAN estimates for the different harvest methods used in each alternative for the experienced budget level in decade one. Generally, the greater the number of trees removed, the greater the effect on vertical structure. The first step (prep cut) of a three-step shelterwood for example, might move a stand from a structural stage 4c to 4b, while a clearcut in lodgepole pine might move the stand from a structural stage 4b to 1. A general ranking of regeneration methods according to their effects on vertical structure at the stand level, from greatest to least would be:

1. Clearcut/coppice
2. Shelterwood
3. Irregular shelterwood
4. Uneven-aged selection

Table 3-41. Acres by Harvest Prescription - Experienced Budget Level Decade 1

	A	B	C	D	E	F	G
Clearcut	5,374	2,587	4,567	4,711	5,471	1,871	5,595
Shelterwood Prep Cut	1,791	1,294	1,562	1,570	1,824	935	1,865
Shelterwood Seed Cut	2,015	862	1,590	1,767	2,052	624	2,098
Irregular Shelterwood Prep cut		336	123			312	
Irregular Shelterwood Seed cut		431				312	
Uneven-aged Selection	2,015	1,677	1,672	1,767	2,052	1,143	2,098
Coppice	1,742	1,742	1,742	1,746	1,742		1,742

Source: Routt FORPLAN Model

Again, this ranking is only general in nature. As with any disturbance, the actual change in structural stage associated with implementation of any of these prescriptions will vary depending on individual site conditions.

In addition to the differences shown in the tables above, Table S-1 shows the number of acres in the three timber management allocations (5.11, 5.13, 5.21). In even-aged systems, management area prescription 5.11 uses a longer rotation age than 5.13 or 5.21. In uneven-aged systems, management area prescription 5.11 uses a longer cutting cycle than 5.13. The longer rotation ages and cutting cycles in management area prescription 5.11 are intended to better match the fire return intervals. The other two management area prescriptions use culmination of mean annual increment to determine rotation age. Table 3-42 shows these differences.

Table 3-42. Rotation Ages and Cutting Cycle Lengths by Cover Type and Alternative

	Mgt Rx 5.11	Mgt Rx 5.13	Mgt Rx 5.21
Lodgepole Rotation Age	200	120	120
Spruce/fir Rotation Age	200	100	100
Aspen Rotation Age	100	100	N/A
Lodgepole Cutting cycle	20	N/A	N/A
Spruce/fir Cutting Cycle	30	20	20
Aspen Cutting Cycle	20	N/A	N/A

N/A = not applicable

Source: Forest Vegetation Simulator and Routt RNV 1994

The rotation ages used in management area prescription 5.11 mean that forest stands would persist in late successional structural stages for a longer period of time, compared to 5.13 and 5.21. In uneven-aged systems, the longer cutting cycle means that the time between entries would be longer.

The effects of timber management on horizontal structure (late successional patch size) will vary according the management area prescription. Because of the spatial nature of the horizontal structure component, effects can only be generally assessed at this level. Patch size will generally decrease in management areas 5.13 and 5.21. In management area 5.11, harvest units are designed to simulate natural vegetation patterns and patch size. However these must be determined at a site-specific level. Table 3-43 shows the percent of late successional forest allocated to 5.13 and 5.21, and 5.11 in the various alternatives.

Table 3-43. Percent Late Successional Forest in Timber Management Allocations

	Management Area Prescriptions

Alternatives	5.11	5.13	5.21
A	20.1	20.3	5.4
B	25.0	0.0	0.0
C	24.6	15.6	0.0
D	11.2	18.1	0.0
E	22.4	26.5	0.0
F	14.2	0.0	0.0
G	28.6	23.8	0.0

Source: GIS (ARC/Info), vegetation and allocation layers

Precommercial thinning is also planned for the management area prescriptions in which timber management will occur (5.11, 5.13, 5.21). Thinning reduces the number of individual trees per acre in a stand and thereby increases the vigor of the remaining trees. It generally does not affect the structural stage but can modify composition to varying degrees. However, modification to the point of reclassifying a cover type will be unusual. Table 3-44 shows the FORPLAN estimates of thinning by alternative by budget level.

Table 3-44. Thinning Levels by Alternative

	A	B	C	D	E	F	G
Experienced Budget Level-Acres Thinned Decade 1	10,218	5,138	10,185	10,191	10,264	2,102	10,227
Experienced Budget Level - Acres Thinned Decade 5	7,572	4,399	6,548	6,605	7,472	4,767	7,636
Full Implementation Level - Acres Thinned Decade 1	10,434	5,231	10,270	10,486	11,027	2,102	10,420

Source: Routt FORPLAN Model

Effects from Vegetation Management - Some vegetation management may occur in management area prescriptions 1.32, 3.21, 3.23, 3.31, 4.2, 4.3, 5.41, 7.1, and 8.3. The types of vegetative management will vary depending on objectives for the management area prescription. For example, in management area prescription 1.32, vegetation may be altered to enhance recreation or provide for vistas; in management area prescription 3.21, light thinning or selective cutting may occur in order to reduce high fuel loads; and in management area prescription 7.1, vegetation should be managed to promote visual screening and minimize fuel loading. These practices can affect both composition and structure of the vegetation. However, their limited size and occurrence should have a very small effect at the forest scale. Site-specific analysis will be required to identify these practices.

Effects on Noxious Weeds

The risk of spread of existing weeds and risk of new invasions is expected to vary between alternatives based on the amount of ground-disturbing activities and on activities that contribute to the introduction of new noxious weed seeds. The risk will be greater in those alternatives with higher ground-disturbing activity levels. However, all alternatives are expected to increase the spread of existing weed species into native vegetative communities based on expected increases in Forest users over the planning period. Increases are expected to occur even with the moderate level of noxious weed control and preventive measures currently planned and predicted in Table S-2. All the alternatives predict increased recreation use (dispersed recreation visits) over the 1994

base year. This increased use is expected to provide new vectors for weed establishment in the backcountry.

Timber harvesting and road building activities vary by alternative, and those alternatives with the higher levels of use could increase the spread of existing noxious weeds. Ground-disturbing activities associated with road building and timber harvest activities are mitigated at the site-specific planning level with increased noxious weed control funding and reforestation activities.

Livestock grazing levels are expected to remain constant throughout the planning period and are likely to provide a source of new weed infestations and create small areas for the spread of existing weeds. Livestock grazing levels outside RNAs are consistent between the alternatives, with the exception of Alternative F. Alternative F would provide a lower level of risk due to decreased use.

Cumulative Effects

Tables 3-45, 3-46, and 3-47 show the cumulative effects of timber management and succession on the Forest. Given that 61% of the forest is currently mature, all tables show that the majority of the forest will be in structural stage 4. Alternative F will have the greatest increase in structural stage 4 after the first decade experienced budget level, followed by B; C, A, and D; E; and G. All alternatives show an increase in structural stage 4. The end of the fifth decade shows a slightly different pattern: F, B, C, D, A, E, and G. As with Decade 1, all alternatives show an increase. Late successional forests show a similar pattern for the 1st decade: F; B, C, and D; A; and E, and G. The fifth decade has Alternative F, followed by B, C, D, A, E, and G. The difference between alternatives as measured by late successional acreage is small for both the first and fifth decade. At the full implementation level, Alternative F has the greatest increase in structural stage 4, then B, C and D, A, G, and E. The pattern for late successional forest is the same.

Table 3-45. Percent Change in Structural Stage by Alternative - Decade 1 Experienced Budget Level

	Structural Stage			
Alternatives	**1 & 2**	**3**	**4**	**4b/4c - Late Successional**
A	-38.9	-40.5	12.5	13.8
B	-55.2	-38.4	12.6	14.2
C	-40.6	-40.5	12.5	13.9
D	-40.0	-40.5	12.4	13.9
E	-38.4	-40.5	12.4	13.8
F	-67.8	-37.1	12.9	14.5
G	-38.0	-40.5	12.4	13.8

Source: Routt FORPLAN Model

Natural disturbance events have not been considered in Tables 3-45, 3-46, and 3-47. The uncertainty associated with predicting these events does not allow this type of analysis. General predictions about where natural disturbance events may occur can be made, but the quantitative analysis necessary to develop Tables 3-45, 3-46, and 3-47 is not possible. The data in Table 3-37 can be used as an indicator of disturbance influence on vegetation. The greater the number of acres in the disturbance accepted

category, the greater the probability of a disturbance event occurring simply because there are more acres available. Ranked in that order, the alternatives are listed as F, B, D, C, A, E, and G. The low frequency, high intensity pattern of fire disturbance on the Forest (Routt National Forest 1994), along with other disturbance processes, will in time affect the diversity of structural stages and cover types in the areas where disturbance is accepted .

Table 3-46. Percent Change in Structural Stage by Alternative - Decade 5 Experienced Budget Level

	Structural Stage			
Alternative	**1 & 2**	**3**	**4**	**4b/4c - Late Successional**
A	-69.3	-43.1	14.7	16.7
B	-81.3	-47.6	16.3	18.8
C	-72.2	-44.6	15.2	17.2
D	-71.1	-44.2	15.0	17.0
E	-67.3	-42.9	14.5	16.4
F	-85.2	-51.7	17.5	20.2
G	-66.5	-42.7	14.4	16.3

Source: Routt FORPLAN Model

Table 3-47. Percent Change in Structural Stage by Alternative - Decade 1 Full Implementation Budget Level

	Structural Stage			
Alternative	**1 & 2**	**3**	**4**	**4b/4c - Late Successional**
A	-23.8	-40.5	11.7	12.9
B	-52.7	-38.4	12.5	14.0
C	-31.9	-40.5	12.1	13.4
D	-33.4	-40.5	12.1	13.4
E	-20.0	-40.5	11.4	12.4
F	-67.8	-37.1	12.9	14.5
G	-23.0	-40.5	11.6	12.8

Source: Routt FORPLAN Model

Wildlife

Introduction

The Routt National Forest provides a wide diversity of habitats that support over 300 vertebrate species, including approximately 59 mammals, 237 birds, 7 amphibians, and 9 reptiles. These species provide Forest users and visitors with a full range of opportunities that include sport, commercial, and viewing activities.

Historical records reveal that some species once common on the Forest were extirpated in the late 1800s and early 1900s. Examples are the wolf, grizzly bear, and buffalo or American bison. Other species were significantly reduced in numbers and distribution. Some, such as the beaver, have recovered. Others, such as the mink and river otter,

have been much slower to recover and currently occupy only a portion of their historical range.

Big game numbers and management on the Forest mirrors what occurred over much of the western United States and Canada during the last 50 years of the 19th century. Big game numbers throughout the West increased dramatically before World War II. Game preserves, winter feeding programs, and re-introductions were the management focus. On the Forest, as over much of the West, an era of biological game management followed. Scientific research increased dramatically, and hunting was adopted as the primary management tool to control expanding populations and manage habitat.

Currently big game populations are at, or exceed, state of Colorado objectives over much of the Forest. Estimates are that between 20,000 - 30,000 elk and 30,000 - 40,000 mule deer spend time on the Forest. Smaller populations of black bear, bighorn sheep, antelope, whitetail deer, and mountain lion are also year-long or seasonal residents. Cooperative efforts have resulted in species, such as moose, being introduced. A small population of moose introduced on the southeast side of North Park in 1978 has grown to over 600 animals (personal communication N. Barrett). They have expanded into Middle Park, Buffalo Pass, and to the Yampa side of the Gore Range.

Although the state is directly responsible for managing wildlife populations, the Forest Service indirectly affects population numbers, diversity, and species viability through the management of habitat. In 1980, the Forest Service and Colorado Division of Wildlife agreed on a comprehensive, state-wide wildlife management plan for National Forest Systems lands in Colorado.

Public interest and participation in nonconsumptive recreational activities (such as wildlife viewing and photography) has grown significantly over the last several decades. Increased public interest in wildlife and their management has led to the establishment of many wildlife advocacy organizations, such as the Rocky Mountain Elk Foundation, The Mule Deer Foundation, Partners in Flight, the Foundation for North American Wild Sheep, the Wild Turkey Federation, and others. Many of these organizations play an active role in wildlife management on the Forest in partnership with the state of Colorado and the Forest Service.

Legal and Administrative Framework

The Forest Service is directed by 36 CFR 219.19 to maintain habitat for viable populations of existing native and desired nonnative vertebrate species. Viable populations are defined as those with the estimated numbers and distribution of reproductive individuals to ensure that their continued existence is well-distributed. In order to ensure maintenance of viable populations, habitat must be provided to support at least a minimum number of reproductive individuals, and it must be distributed so that the individuals or deems (sub-populations) can interact.

36 CFR 219.19 additionally directs the Forest Service to estimate the effects of changes to wildlife habitat; consult with biologists from other agencies; consider access and dispersal problems of hunting, fishing, and other uses; evaluate the effects of pest and fire management; and select management indicator species to be monitored [36 CFR 219(a)(1)].

In the selection of management indicator species, the following categories shall be represented where appropriate: Endangered and threatened plant and animal species identified on state and federal lists for the planning area; species with special habitat

needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; non-game species of special interest; and additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality. The decision was made to use the same species identified in the 1983 Plan (pp. III-42 to III - 43). These species are displayed in Table 3-48 and potential effects to goshawk, pine marten, osprey, bald eagle, sandhill crane, wood frog, CO River Cutthroat trout and sharp-tailed grouse are discussed in the BA/BE.

These MIS were selected to reflect the habitat needs for the majority of the species inhabiting the Routt National Forest. Effects of changes in habitat due to management of these MIS will be monitored (See Monitoring, Chapter 4, questions 1-6, 1-7, 1-8, 1-9 and 1-12).

Monitoring of Management Indicator Species (MIS)

As per the monitoring requirements of 36CFR 219.19 (a)(6), changes in habitat and population trends of those management indicator species identified below will be monitored, in cooperation with state fish and wildlife agencies, by comparing the HABCAP capability outputs (baseline FY98) and Colorado Division of Wildlife (CDOW) population estimates. An MOU with the CDOW will be pursued to establish available population data for MIS (Chapter 4, p. 4-4; see also 1998 Monitoring Plan of Operations letter).

Generally, terrestrial species on the Routt National Forest are associated with natural disturbance (USDA 1996). Thus their populations are dynamic and ebb and flow based on the amount and type of disturbances. Because the Forests are located near urban areas, populations may also be effected by disturbances associated with people and politics. This can make measuring populations very challenging and often requires intensive site-specific information. In many cases, populations may need to be measured on a project-by-project basis. However where it is possible the following methods will be used.

Mammals and their habitats, particularly large mammals and game species, are monitored by the Colorado Division of Wildlife. There is already a cooperative mechanism in place whereby the Forest receives population information. Some examples of these include:

1. Annual Colorado Division of Wildlife Official Harvest Statistics. These include population estimates by Data Analysis Unit (DAU) for big and small game. Some animals included in these estimates include deer, elk, antelope, moose, black bear, lion, bighorn sheep, and mountain goat.
2. Unit management plans for specific animals; for example, the elk management plan for Game Management Units.
3. The Wildlife Resource Information System (WRIS). Mostly for habitat information like migration routes and winter range locations.

The Forest has access to all of the information generated by the Colorado Division of Wildlife. These sources will be used as appropriate.

Nongame species will be monitored on a case-by-case basis using Colorado State University (CSU) studies, U.S. Fish and Wildlife Service data and information, and The Colorado Natural Heritage Program Data Base or Colorado Natural Heritage Program partnerships. If the information doesn't exist or is not obtainable through any of the previously mentioned sources, populations and habitat will be monitored using stakeholders and formal partnership with organizations like the Rocky Mountain Elk Foundations.

Game birds and raptors are monitored by the Colorado Division of Wildlife on a case-by-case basis with efforts like the Annual Harvest Statistics Report, wing barrel surveys, and questionnaires. The Forest has access to all information generated with these methods. For raptors, the Division uses individual studies done by the Division or in partnerships with universities and volunteers. All of the information generated by these partnerships is available to the Forest. Neo-tropical species are monitored by the Division using MAP (Migratory Avian Productivity) stations and again this information is available to the Forest. Many bird species are monitored using the annual breeding bird census information. In specific cases, bird species may be monitored through partnerships with the Colorado Bird Observatory. When information is not available through these sources, other sources of information will be pursued including partnerships with CSU and The Colorado Natural Heritage Program.

Amphibian populations and habitat are monitored using the Colorado Division of Wildlife data. There should also be information on areas where activities like transplants can take place. Other sources for general amphibian information include the Frog Log, an international amphibian monitoring and information-sharing formal network. The Colorado Natural Heritage program data base will also be used as a source for identifying, on a project-by-project basis, the location of amphibian populations.

Specific aquatic habitat quantity and quality information is collected by Forest personnel during programmatic inventories or during planning for specific management activities. Broad monitoring of aquatic populations on the Forest is conducted by the Colorado Division of Wildlife on a recurring basis. Site-specific inventories are conducted by CDOW, Forest Service, university students, or private entities on a less frequent basis. Future monitoring will emphasize more consistent use of peer-reviewed methods of quantifying aquatic habitats.

Key Indicators

- Predicted changes in the composition, structure, function, pattern, and distribution of wildlife habitats.
- Miles of road proposed for construction and resulting road density.
- Changes in levels of habitat effectiveness.

Resource Protection Measures

Numerous standards and guidelines, both forestwide and management area specific, are included in all of the proposed alternatives. This is to ensure that quality habitat for wildlife is maintained or enhanced.

In addition to the standards and guidelines, allocations to certain management areas prescriptions limit activities with the potential to adversely affect wildlife. These include:

- 1.41 Core Areas (Alternative F)

- 3.55 Corridors (Alternative F)
- 5.41 Deer and Elk Winter Range (All Alternatives)

Affected Environment

The wildlife section focuses on wildlife habitat and species important for social and recreation purposes and addresses issues within the revision topics of biological diversity and recreation opportunities. This section is divided into three sub-sections:

- Wildlife Habitats
- Wildlife Disturbance and Displacement
- Recreation Opportunity (Hunting)

Wildlife Habitats

Six habitat complexes, two structural components, and a specialized component were selected for the Forest to represent the affected environment for wildlife habitat and serve as indicators for effects on their associated species. In addition, three commonly hunted, economically important species were also evaluated in terms of how the proposed alternatives affected potential habitat for these species.

The habitat complexes include only the appropriate habitat structural stages. For example, for late successional spruce/fir, only the later structural stages 4b, 4c, and 5 were considered as potential old growth. All structural stages except the seedling sapling stage (i.e. SS1) were evaluated for lodgepole pine. For the aspen community type, all structural stages 3 and 4 were considered. (See vegetation section for discussion of habitat structural stages.)

Table 3-48 is a habitat matrix that displays an estimate of the current amount of the various wildlife habitat complexes on the Forest and the selected management indicator species (MIS) that are associated with them. Combined with the matrix and discussion for the threatened, endangered, and sensitive (TE&S) species elsewhere in this document, all species on the Forest that are listed as TE&S or identified as management indicator species to be monitored during project implementation have been discussed. The predicted effects on the species and their habitat have also been disclosed.

Snags and Coarse Woody Down and Dead

Snags - Snags, or standing dead trees, are considered to be a special unique habitat because they provide valuable nesting, foraging, and roosting habitat for a variety of Forest species and are not restricted to any one vegetative or habitat complex.

Coarse Woody Down and Dead - Large downed logs provide essential habitat for many species and contribute to the attributes and functional features of most later successional and old growth habitats.

Spruce/fir and lodgepole pine habitat complexes have historically provided a high percentage of snags and downed logs. Photo points initiated on the Forest in 1921 and taken 40 to 45 years following a large burn in Engelmann spruce, subalpine fir, and lodgepole pine showed hundreds of snags still standing. This suggests that a large number of snags remain standing up to 50 years following large stand-replacing fires. In addition, insect and disease outbreaks also create large numbers of snags, as evidenced on the Yampa District after spruce beetle outbreaks in the 1940s and 1950s.

Table 3-48. Estimate of Potential Habitat by Habitat Community for Selected Management Indicator Species (MIS) on the Routt National Forest (in thousand acres)								
	Habitat Complexes*							
Species	1 Snags/ DWoody	2 M.Conf	3 Asp	4 Shrub	5 G/F	6 R/WT	7 LPP	8 Spec.
common flicker	>8 sn/acre							
hairy woodpecker	>8 sn/acre		260.4					
red-backed vole	>8 sn/acre						379.1	
pine grosbeak		254.0						
warbling vireo			260.4					
blue grouse		254.0		68.6	117.7			
beaver						61.3		
ptarmigan								53.7
vesper sparrow					117.7			
sagebrush vole				68.6				
brown c.rosy finch								53.7
Wilson's warbler						61.3		
elk		254.0	260.4	68.6	117.7		379.1	
mule deer		254.0	260.4	68.6	117.7			
blue-gray gnatcatcher				68.6				
green-tailed towhee				68.6				
goshawk (sensitive species)		254.0						
pine marten (sensitive species)		254.0						
osprey (sensitive species)		254.0						2.9
bald eagle (endangered)		254.0						2.9
greater sandhill crane (sensitive)						61.3		
wood frog (sensitive species)						61.3		
CO river cutthroat (sensitive)								**1.8
sharp-tailed grouse (sensitive)				68.6				

*Habitat complexes: 1 Snags and downed woody; 2 Mature conifer (includes subalpine fir, Engelmann spruce); 3 Aspen; 4 Mixed Deciduous Shrub; 5 Grassland/Forb; 6 Riparian/Wetland; 7 Lodgepole Pine; 8 Specialized (alpine/talus), open water; **perennial rivers/streams (miles)

Source: GIS (DWRIS) and Routt RNV Report

Mature Conifer and Late Successional Habitat

Mature conifer forests on the Routt National Forest can be classified into two distinct landscape patterns that often differ by elevational zone. Mid-elevation spruce/fir forests are usually larger, more contiguous blocks of late successional habitat. At higher elevations, this pattern is more fragmented by meadows, lakes, streams, and rock talus. Each of these distinct older-aged forests supports different understory plant communities and often different associated wildlife species.

Late successional Engelmann spruce/subalpine fir compose approximately 254,000 acres or approximately 23% of the total forested acres. This only includes the later structural stages; in total, there are about 454,000 acres of Engelmann spruce/subalpine fir (Table 3-15, Biological Diversity section) comprising approximately 41% of the forested acres (Table 3-16, Biological Diversity section). A reduction in the acreage burned on the Forest since the late 1890s has led to an increase in this habitat, most notably of shade-tolerant subalpine fir.

Aspen

Mature aspen stands have dense grass, forb, and shrub understories and provide habitat for a diversity of species, particularly birds. The relatively short life of aspen and annual shedding of its foliage create numerous micro-habitats not usually found in coniferous cover types.

Currently there are approximately 260,000 acres (Table 3-15) of aspen on the Forest, which is about 24% of the total forested vegetation (Table 3-16) composition. The principle disturbance agents of aspen over the last several hundred years on the Forest have been wildfire and decay fungi. Due to a great reduction in fire-induced rejuvenation on the Forest, the overall age of aspen stands have increased dramatically. There are far more late seral aspen stands now than existed prior to the creation of the Forest at the end of the 19th century (Routt National Forest 1994). The total composition of aspen (estimated to be between 20 - 25%) is within natural variation (Table 3-16).

Lodgepole Pine

Lodgepole pine-dominated habitat complexes are far more common on the east side of the Forest. The structure and composition and function of the stands vary greatly depending on site conditions and stand age. Dense, stagnant stands of lodgepole provide little opportunity for understory diversity and little forage value. However, as they begin to mature and die from insects and diseases, they begin to exhibit multi-stand structures with increased snag and downed woody components. This provides more in composition diversity and increased wildlife habitat potential.

Lodgepole pine community habitats currently are estimated at just over 379,000 acres (Table 3-15) or about 35% of the forested total (Table 3-16). This is at the low end of the historical range of 35 - 45%. Past harvesting on the Forest has often removed lodgepole pine in favor of the longer living Engelmann spruce.

Mixed deciduous/shrublands

Shrub communities on the Forest provide habitat for numerous wildlife species and are often used extensively during seasonal migrations by small birds and big game, such as elk and mule deer. Sagebrush, snowberry, bitterbrush, oak brush, serviceberry, and chokecherry are commonly found in shrub communities on the Forest. These berry-, bud-, and acorn-producing plants provide a major source of forage for wildlife.

The current estimate of approximately 68,600 acres accounts for about 5% of the Forest (Table 3-32). This habitat appears to be at the high end of the historical range of 2 - 4%. According to estimates, about 90% of the shrub species identified almost 100 years ago are still present. The older stands, particularly oak brush, that originated from fire are likely to decrease in the future due to fire suppression over the last several decades.

Riparian/Wetland

This habitat complex includes riparian ecosystems and wetlands associated with lakes, reservoirs, ponds, springs, and wet meadows. A variety of riparian plant communities occur on the Forest, the most common being willow- and alder-dominated. Dense vegetation provides cover and forage year-long and seasonally for many species. This habitat complex is used extensively by Forest amphibians, reptiles, and migrating Neotropical birds.

Riparian/wetland communities account for approximately 61,000 acres or 5% of the Forest (Routt National Forest 1994). The Forest appears to have fewer acres of riparian communities than it did in the 1850s. The composition and structure of the riparian

vegetative community has been altered by land-use activities, causing this habitat community to be outside of the range of natural variability (id.).

Grassland/Forbs

Grasslands, rangelands, and mountain meadows vary greatly on the Forest by soil type, slope, aspect, and elevation. Meadows lying within an elevational range of 7,000 to 12,000 feet occur in mountain valleys, swales, parks, and around potholes. Grasses and sedges give this habitat its characteristic appearance. Forbs are another important component and may comprise 20% or more of the total.

Grasslands currently account for approximately 117,000 acres or just under 9% of the total Forest cover types. This appears to be well within the historic range of natural variability of 8 to 10%. Heavy livestock use in the past likely contributed to the early seral condition of current Forest grasslands (Routt National Forest 1994).

Specialized Habitats - Alpine/Talus

The current estimate of just under 54,000 acres (4% of the total Forest cover types) has not changed in composition, structure, or pattern significantly over time.

Wildlife Disturbance and Displacement

Road Density - Generally the level of disturbance and displacement of elk and other wildlife will increase as roads and associated human activity increases. The relationship between elk and roads has been shown to be mainly behavioral. When new roads are constructed, there is an initial period of learning and adapting, but over time a specific, consistent, and measurable use pattern develops. The result is a decline of usable habitat. Most of the habitat can be reclaimed by restricting access to nonmotorized traffic (Lyon 1990).

The Forest currently has an estimated open road density of just under 1 mile of open road per section (640 acres). This road density average includes designated wilderness and other unroaded areas. The current open road density not including wilderness and other roadless inventory area acres is just over 1 mile (1.09 miles) of open road per section.

Habitat Effectiveness - Habitat factors that affect the abundance and distribution of wildlife can be evaluated and rated to describe the habitat effectiveness or potential habitat use by wildlife. Habitat effectiveness is defined as the percent of usable habitat during the non-hunting season (Lyon and Christensen 1992). Generally habitat effectiveness values and models have been developed specifically for elk, using the variables of road density and cover availability (Lyon et al 1983). This concept is often misused and misapplied. It was intended to measure the effectiveness of summer and early fall habitat to meet elk needs on summer range. An important issue on the Forest relating to the topic of recreation opportunity is big game, particularly elk, leaving the Forest before or early in the hunting season. While it is true that factors other than habitat can contribute to this problem, the best measure of the effects that forest management activities contribute to wildlife disturbance and displacement is to apply habitat effectiveness levels. Currently the Forest is estimated to have a forestwide habitat effectiveness of 58% (based on a potential of 100%), using the model developed by Lyon and modified for regional use.

To put the habitat effectiveness number in context, in areas where elk are one of the primary resource considerations, habitat effectiveness should be maintained at 50% or greater. In areas intended to benefit elk summer range and retain high use, habitat

effectiveness should be 70% or greater. Areas where habitat effectiveness is retained at lower than 50% are recognized as making only minor contributions to elk management goals (Christensen et al 1993).

Under the 1983 Plan, 41,000 acres are allocated to a deer and elk winter range prescription on the Forest. A guideline was developed to maintain a high level of habitat effectiveness and reduce stress to wintering big game animals from other activities during the winter months (Plan, p. 2-47).

Recreation Opportunity (Hunting)

Throughout the history of the Forest, fall big game hunting has been a traditional use and activity that is valued by residents and nonresidents alike. Hunting is also an important contributor to the local and regional economy. For the year 1990 in the state of Colorado, hunting and fishing directly accounted for over $540,000,000 (McKean and Nobel 1990). Estimates from the Forest and surrounding areas were over $70,000,000 (McKean and Nobel 1990).

Over much of the West, including northwestern Colorado, elk and other big game populations have increased over the years. In many areas, the populations are at, or approaching, record levels. While on the surface this would indicate that hunting quality and opportunity are also good, wildlife researchers and managers are beginning to recognize several disturbing trends.

In many hunting areas state big game managers have restricted the lengths of hunting seasons. This is to maintain the numbers of males in the populations and the bull/cow and buck/doe ratios. Other restrictions implemented include antler point restrictions, split seasons, and limited entry or quota systems.

Big game hunters in northwestern Colorado have increased over 400% since 1953 and 13% since the 1983 Plan. Outfitter/guides operating on the Forest have more than doubled since 1983. Open road densities have increased from approximately 0.80 miles per section in 1983 to 0.95 miles per section currently.

Conflicts have arisen between the need for hunter access to Forest lands and the need for less pressure, expressed in the number of hunters. Decreased hunting opportunities on the Forest and increased conflicts with private land livestock operations have resulted from large numbers of elk leaving the Forest in early fall. This problem is particularly acute in the North Park area.

Elk vulnerability is a relatively new concept that deals with security for big game during hunting season. Its primary objective is to provide elk and other big game with large blocks of security cover away from open roads. Security cover is defined as a block of cover at least 250 or more acres in size and at least 1/2-mile from open roads (Hillis et al. 1991). To be successful, this concept requires close coordination and communication between Forest Service managers and their state counterparts and would include radio telemetry tracking of elk before, during, and after the fall hunting season. This information would then be used to build a GIS computer mapping layer to map current and replacement elk security areas. For example, there are currently 140,800 acres on the Forest that meet the definition of a security area. This total includes 137 blocks comprising 115,300 acres of mature conifer and 52 blocks comprising 25,500 acres of mature aspen.

Environmental Consequences

Wildlife Habitats

The following is a summary of the predicted direct and indirect effects on wildlife habitats. The associated management indicator species, which are analyzed at the Forest Plan level and monitored at the project level, have been included under their preferred habitat. All federally listed threatened or endangered species and those sensitive species included on the Regional Forester's Sensitive Species List that are known or suspected to occur on the Routt National Forest have been addressed in the biological diversity section of this document.

Direct and Indirect Effects on Wildlife Habitat

Snags and Coarse Downed Woody

Associated species

- Hairy Woodpecker (snag component of young to mature structural stages)
- Common Flicker (unique habitat that can be monitored)
- Red-backed Vole (unique habitat that can be monitored)

A GIS analysis using data from RMRIS indicates that forestwide there is an average of slightly over eight snags per acre (over 10 million total snags). Effects to the hairy woodpecker, common flicker and red-backed vole are not expected to vary by alternative. All alternatives would continue to exceed the levels recommended for snags and woody debris. In addition to the forestwide analysis, the 29 geographic areas were analyzed individually for snags. Of these areas, 19 were rated average, 5 were rated high, and 5 were rated low.

All alternatives would require a minimum of at least one snag per acre following management activities (Plan, pp. 1-8 through 1-9). Projected numbers of snags forestwide under any of the alternatives would exceed the minimum numbers of snags required for primary and secondary cavity nesters (1.3 and 1.7 respectively, Hoover and Wills 1984).

A snag analysis completed over the last 5 years on a portion of the Forest suggests that the number of usable snags could be less than is assumed in the literature. For example, of 349 random snags surveyed, only 18 contained cavities suitable for nesting. The analysis also concluded that only 27% of the snags were in broken topped trees, yet 78% of the snags having woodpecker holes were in broken-top trees. While this data is preliminary, it does suggest that snag retention standards could need revision in the future.

Mature Conifer and Late Successional

Associated species

- Pine Grosbeak (represents a large group of species)

Late successional spruce/fir habitat would not vary substantially between alternatives over the short term or long term (Figure 3-13). Effects to the pine grosbeak are not expected to vary substantially by alternative. Alternative F would have the least effect to pine grosbeak, while Alternatives A and E would have the greatest. The greatest

decrease would be less than 4% (long term) under Alternatives A and E and the least decrease, less than 1% (long term), under Alternative F. Under all alternatives, over 240,000 acres of mature conifer (late successional habitat) would be retained. In addition to the forestwide analysis, 29 proposed geographic areas were individually analyzed and habitat structural stages predicted for each. This was over the short term and long term for all proposed alternatives, to assure adequate distribution. Results were similar to the forestwide analysis. Very little change in overall composition and structure were predicted (less than 10% deviation from the current condition) for any of the proposed alternatives. This would be true under either the experienced or full implementation budget level.

Aspen

Associated Species

- Warbling Vireo (represents a large group of species)
- Hairy Woodpecker (represents a large group of species)

The composition, structure, function, and pattern of aspen changes little over time under any of the proposed alternatives. The percentage of this habitat forestwide would remain at 19% and would vary less than 1% by alternative over both the short term and long term. Effects to the warbling vireo and hairy woodpecker are not expected to vary by alternative. Since the majority of aspen stands on the Forest developed over the last several hundred years from disturbance agents such as fire and decay fungi, control and reductions of these processes have reduced regeneration of aspen. This has resulted in older-aged stands than those historically present. With this in mind, a forest-wide guideline is included for all alternatives: "Maintain aspen, even at the expense of spruce/fir or other late successional stands" (Plan p. 1-8). No significant direct or indirect effects to aspen are predicted as a result of any of the activities permitted in the alternatives at either the experienced or full implementation level.

Lodgepole Pine

Associated species

- Red-backed Vole

Lodgepole pine-dominated wildlife habitat would increase slightly in all alternatives, except Alternative E (6% decrease). The increase would not be great, ranging from under 1% in Alternative E to less than 5% for Alternative F in the long term, thus effects to the red-backed vole are not expected to vary greatly by alternative. Effects at the experienced budget level would result in slightly more lodgepole-dominated habitat under all alternatives.

An analysis of the 29 geographic areas displayed a range of between 64% and less than 1% in percentage of mature lodgepole acreage compared to the entire geographic area. This compares to a percentage of approximately 28% forestwide.

Mixed Deciduous/Shrublands

Associated species

- Blue-Gray Gnatcatcher (unique habitat that can be monitored)
- Green-tailed Towhee (unique habitat that can be monitored)
- Sagebrush Vole (unique habitat; represents several other species)

All of the proposed alternatives retain shrub habitats within 14% of existing acreages (approximately 68,600 acres) for the full budget level (Figure 3-15). Alternatives G, E, and A result in more acres of shrub habitat over both the short and long term. Increased habitat for the blue-gray gnatcatcher, green-tailed towhee and sagebrush vole would be best under Alternatives G, E and A. Alternatives F and B result in less than 7% increase over the short term and long term. Alternatives C and D result in increases of less than 12% for both the short and long term. An analysis of the 29 geographic areas resulted in a current range of from 15% to less than 1% in shrubs. This, compared to the 5% forestwide in shrubs, indicates this important wildlife habitat is well-distributed over the Forest and would remain so under any of the proposed alternatives.

Effects on shrub composition, and distribution would be similar under the experienced budget level for the short term and would result in less shrub habitats over the long term (Alternatives A, E, and G at 7%).

Riparian/Wetland

Associated species

- Wilson's Warbler (unique habitat that can be monitored)
- Beaver (unique habitat that can be monitored)

The total acres of riparian/wetland habitat would not vary by the proposed alternatives (under either budget level) from the current Forest total of nearly 61,000 acres. Effects to Wilson's warbler's and beaver are not expected to vary by alternative.

The potential risk for adverse effects to riparian and wetland habitat is directly related to the levels of proposed activities that could impact and disrupt these systems. For grazing and timber harvest the risks are related to the timing and magnitude of disturbance. The alternatives would rank E, G, A, C, D, B, and F in terms of risks of impacts from domestic grazing. The alternatives would rank E, D, A, G, C, B, and F in terms of potential risk from timber harvesting and related activities at the full budget level.

Grassland/Forbs

Associated species

- Vesper Sparrow (unique habitat that can be monitored)

The total percentage of the Forest in the grass/forb vegetation type would slightly increase under all alternatives for both the short term and long term over the current composition of just under 10% at the full budget level (Figure 3-16). Effects to the vesper sparrow would be least under Alternative F, and greatest under Alternative E. This small percentage increase would range from under 2% for Alternative F to less than 10% for Alternative E. The increases over the current condition is primarily related to the acres converted from mature and immature timber structural stages to grass/forb stages following timber harvest. An analysis of 29 geographic areas shows that currently the grass/forb wildlife habitat ranges from a high of 35% to a low of 2% as a percentage of the total geographic area.

Effects would be about half under the experienced budget levels, resulting in less grass/forb habitat.

Specialized Habitats: Alpine/Talus

Associated Species

- Brown Capped Rosy Finch (unique habitat that can be monitored)
- Ptarmigan (unique habitat that can be monitored)

The current (approximately 54,000) acres of alpine/talus habitat will not be directly or indirectly effected by implementation of any of the proposed alternatives at either budget level. No management activities or roads are proposed for this alpine habitat. Effects to the brown-capped rosy finch and ptarmigan are not expected to vary by alternative.

Predicted effects for other specialized wildlife habitats, including caves and abandoned mine shafts, are disclosed under the threatened, endangered, and sensitive species portion of the biological diversity section.

Game Species:

Associated Species

- Elk (economically important; public issue)
- Mule Deer (economically important)
- Blue Grouse (economically important; utilizes a wide range of habitats)

Elk, mule deer, and blue grouse use a variety of habitats during the course of a year and thus serve as indicators for young to mature forest structural stages and openings within or adjacent to forest. Ecosystems with a diversity of age classes, canopy closures, and density supply both forage and cover requirements. All of the proposed alternatives provide adequate amounts and distribution of habitats to support state objectives for these game species. Elk are at, or approaching, state of Colorado population objectives over most of the northwest and northeast State Game Management Regions that include the Forest. Despite heavy winter mortality in 1993, mule deer herds are stable in these two regions (personal communication, R. Firth). Like most game birds, blue grouse populations are cyclic. Grouse chick survival varies greatly from year to year, depending on annual weather and precipitation patterns.

No adverse effects to the quantity or distribution of habitat are anticipated for these three game species under any of the proposed alternatives at either budget level. Effects of the proposed alternatives on wildlife disturbance and displacement and recreational hunting are disclosed later in this section.

Summary of Effects on Wildlife Habitats

On the basis of this analysis and by using the best information available, it is apparent that the types and levels of management activities proposed in this Revised Plan would continue to provide nearly the same diversity and distribution of wildlife habitats as are currently present under both the experienced and full implementation budget levels. Although the various alternatives would move the Forest in different directions in terms of management emphasis, this analysis concludes that the composition, structure, pattern, and distribution of wildlife habitats would not significantly change over time.

Refer to the sub-section on threatened, endangered, and sensitive species in the Biological Diversity Section for a disclosure of predicted effects of the proposed alternatives on habitat necessary to assure maintenance of viable populations of vertebrate species.

Population trends for the MIS listed above are expected to follow the predicted direct and indirect effects of their associated habitat(s), as stated above. Viable populations are expected in all alternatives due to Forest habitat management. Habitat necessary to assure maintenance of viable populations will continue. This is based on the above analysis, other analyses within the biodiversity section of the FEIS, and direction in the Forest Plan (Goals and Objectives, Standards and Guidelines) that maintains and improves habitat for wildlife.

Wildlife Disturbance and Displacement

Road Density

General Effects

Alternatives that increase total Forest open road miles have the potential to displace and disturb wildlife, especially during periods of high vehicle use and winter, birthing, and hunting seasons. The Forest open road density is simply the miles of road per section and is calculated by the total sections of the Forest divided into the total road miles.

Elk is the big game species most vulnerable to road activities, and this is well documented in the literature. Lyon (1983) determined that potential elk use of an area correlated closely with the miles of open road per section. When road levels approached 1 mile per section, potential elk use dropped from 100% to 60%. When road levels were at 2 miles per section, potential elk use declined to 50%; when levels approached 6 miles per section, the area was rarely used by elk at all.

The road density on the Forest is currently estimated to be under 1 mile per section. An analysis of the 29 geographic areas determined that they ranged in road density from 1.39 miles per section to .12 miles per section. Seven of the areas have road densities greater than 1.0 miles per section, while eleven have road densities less than .50 miles per section. Uninventoried two-track roads exist on the Forest, but generally occur at a low density with a few areas of concentrated occurrence (Willow Creek and Owl Mountain Geographic Areas). These roads are not part of the Forest road system and are not designated for motorized use. Any use of these roads is considered illegal. During implementation of the Forest plan, these roads will be identified and either obliterated or included in the Forest road system.

The primary effect of illegal travel on these roads is disturbance to wildlife, especially during the hunting, winter, and birthing seasons. Disturbance is generally limited to times of high forest use (such as hunting season) and does not vary by alternative. Management through obliteration or other physical closure as identified during project implementation will reduce the effects to wildlife due to any illegal use of these roads.

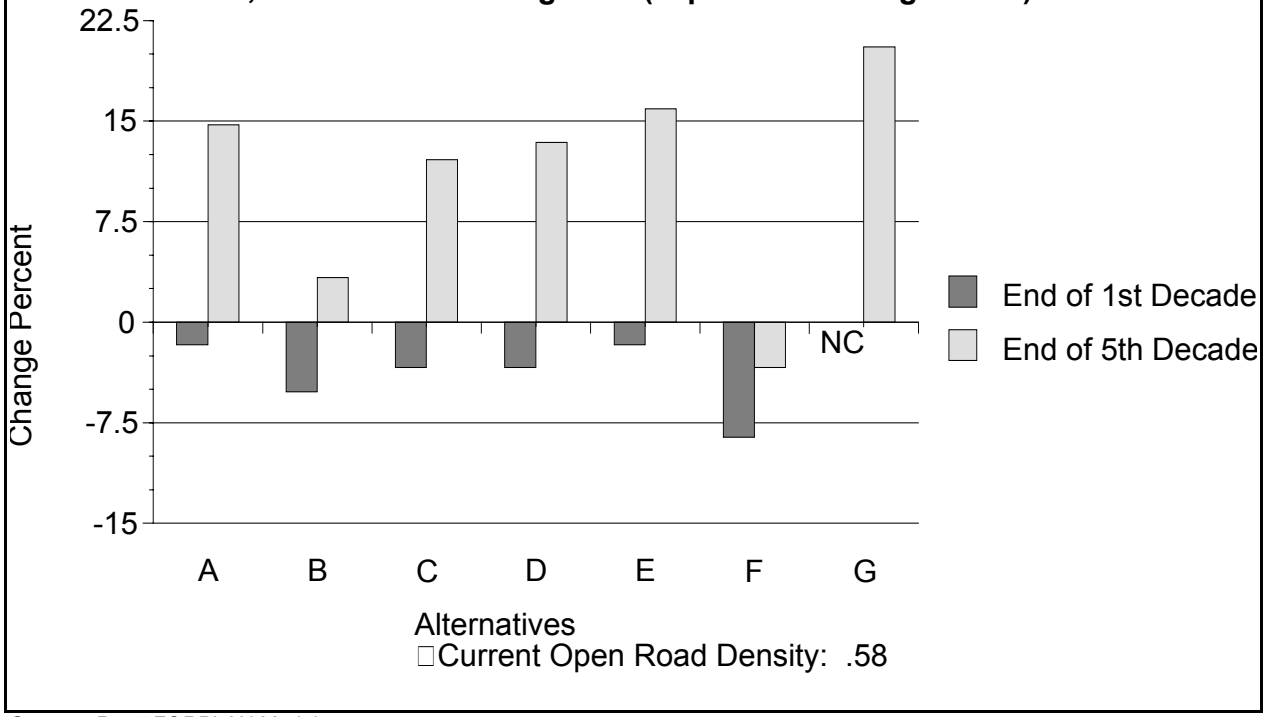
Predicted changes in open road densities by alternative (Figure 3-21) over the short term and long term range from a decrease of less than 10% over the short term (Alternative F) to an increase in open road density at about 20% under Alternative G. Predicted changes looked at the number of proposed roads constructed and reconstructed by alternative, as well as number of roads proposed for obliteration by alternative. Open road density would still be under 1 mile per section for all alternatives over the long-term.

Summary of Direct and Indirect Effects

Direct and indirect effects are related to the miles of road proposed for construction. Implementation of Alternative G would result in the highest open road density forestwide, followed by A, D, C, B, and F at the experienced budget level.

The projected increase of 20% under Alternative G would result in a forestwide density of .73 miles per section over the long term, compared to Alternative F with a projected decrease of over 3% at the experienced budget level. The open road density under all alternatives would be less than 1 mile per section forestwide over the long term. Effects were projected to increase over those displayed under the full implementation level, with an estimated open road density of 0.83 over the long term for Alternative E.

Figure 3-21. Projected Percentage Change in Open Road Density Forestwide, b Alternative, short-term and long-term (experienced budget level)



Source: Routt FORPLAN Model

Habitat Effectiveness

General Effects

Generally, the level of effect of disturbance and displacement to elk and other wildlife will increase as roads, reductions in cover, and human activity increase. Over time, a specific use pattern develops that is consistent and measurable. The result is a decline in usable habitat. Habitat effectiveness is one of the best measures and predictors of this impact.

The habitat effectiveness model developed by Lyon 1983, and modified for regional ecosystems, was used to predict effects on habitat effectiveness for the proposed alternatives. This model uses miles of road per section and hiding cover (vegetation capable of hiding 90% of a standing adult elk from human view at a distance equal to or less than 200 feet).

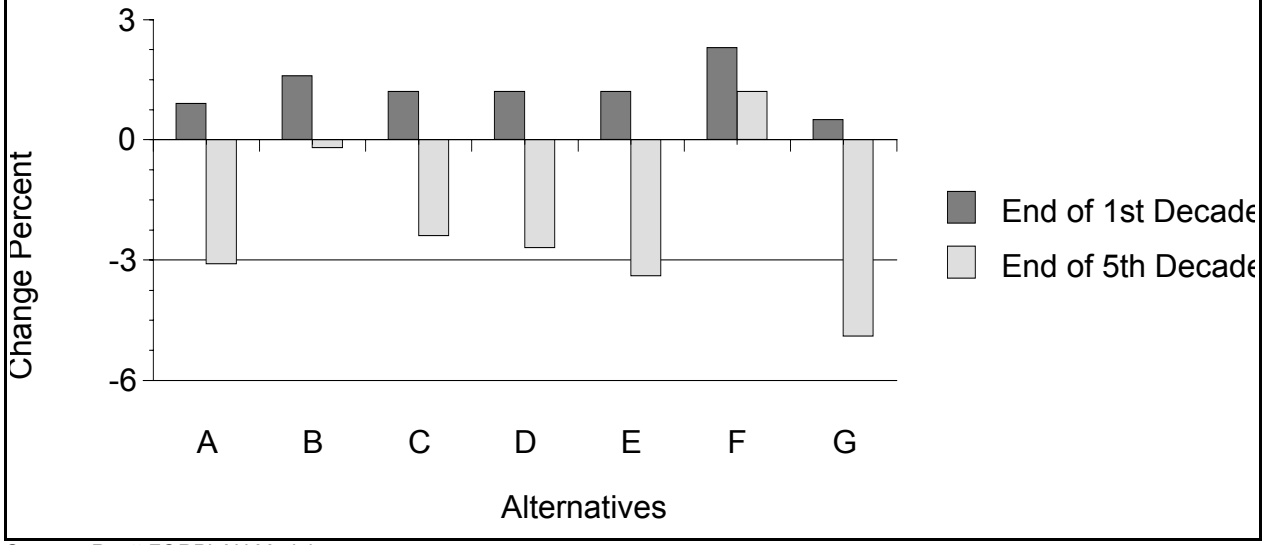
For reference, the current estimated habitat effectiveness for the Forest indicates that approximately 58% of the available habitat is usable by elk during the nonhunting season.

Figure 3-22 displays the predicted change in habitat effectiveness forestwide under the proposed alternatives for both the short term and long term. The results are displayed by the predicted percent increase or decrease in habitat effectiveness level.

Summary of Direct and Indirect Effects

As is disclosed in Figure 3-22, habitat effectiveness forestwide will decrease under all proposed alternatives (except F) over the long term at the experienced budget level. The predicted decrease ranges from 5% under Alternative G to just above a 1% increase under Alternative F over the long term. For each percentage decrease, approximately 13,000 acres of Forest habitat are reduced. It is important to stress that these are forestwide averages. Effects to individual geographic areas, watersheds, and drainages can vary significantly and would be analyzed and monitored at the project level. All alternatives include a forest-wide standard that requires habitat effectiveness to be maintained at 50% or greater in forested ecosystems (Plan, p. 1-14).

Figure 3-22. Projected Percentage Change in Forestwide Habitat Effectivenes by Alternative, Short-term and Long-term, by experienced budget level.



Source: Routt FORPLAN Model

Habitat effectiveness would decrease an estimated additional 11% under the full implementation level under Alternative E, followed by G, A, D, C, B, and F.

The alternatives vary in the number of acres allocated to deer and elk winter range (MA 5.41) as shown in Table 3-49.

Table 3-49. Acres Allocated to Winter Range

Alternative	Acres Allocated
A	44,800
B	43,000
C	57,700
D	48,600
E	48,300
F	11,300
G	50,900

Source: GIS (ARC/Info), allocation layers

A guideline for a higher level of habitat effectiveness is prescribed for management area prescription 5.41 under all of the alternatives (a minimum of 70% in forested ecosystems), and motorized traffic will be prohibited during the winter and spring.

Recreation Opportunity (Hunting)

General Effects

Big game vulnerability and overharvest, particularly of bull elk, have consistently been related to certain identified factors that include increased densities of open roads during the hunting season, decreasing amounts of cover, and fragmentation of cover into small patches. These and other factors often lead to elk and other big game leaving the Forest before (or early in) the hunting season. This creates more restrictive hunting seasons, with increased regulations, shorter seasons, and in many western states, limited entry (permit only) hunting.

The GIS computer mapping system was used to estimate the total number and distribution of elk security blocks currently on the Forest. These blocks were mapped for the 29 individual geographic areas and summarized for the entire Forest.

Potential effects on these existing security blocks by alternative were estimated by considering projected increases or decreases in road miles, acres harvested, roadless acres, and projected levels of habitat effectiveness.

Summary of Direct and Indirect Effects

It is not possible to accurately model or estimate the actual number and location of security blocks that would be affected at this level of programmatic planning. It is possible to generally estimate the potential risk of effects based on the criteria described above. Alternative G would pose the most risk of reducing elk security blocks and acreage. Alternatives A, B, C, and D are predicted to be similar in effects over time and are predicted to moderately reduce the current number and acreage. Alternative B would have no significant effect, and Alternative F would slightly increase the areas based on proposed road closures and allocation of "core" wildlife areas.

It is important to note that security areas, like other ecosystem components and elements, are dynamic and change regardless of management activities and human-induced disturbances. In a matter of hours, wildfires can eliminate a large security block, that took nearly a century to develop. Security areas are continually being altered over time due to natural processes of vegetative succession and disturbance. By definition, security areas can also be created by restricting motorized access during hunting season.

Effects would not change significantly by budget level.

Effects of Proposed Management Activities

Effects from Fire Management - Fire management could have a variety of positive and negative effects on wildlife habitat. The composition, structure, function, and pattern of the wildlife habitats on the Forest have resulted in a large part from fire. Many of the lodgepole and aspen stands within the Forest are the result of some fire event. Prior to the 1900s, fire was the primary agent of disturbance. Effective fire control during the last several decades has resulted in wildlife habitats that have been shifting to later successional habitat, particularly the spruce/fir and aspen habitats.

Managed fire can have a very positive effect on wildlife habitat by increasing the amount and availability of plant nutrients and increasing the diversity of vegetation, particularly the early successional stages. Fire is a primary management tool used to improve and stimulate wildlife habitat, especially big game forage. Alternatives that emphasize wildlife management and wildlife habitat improvement would result in more prescribed fire for habitat improvement. The alternatives would rank as follows in terms of emphasis placed on wildlife management: F, B, C, D, A, G, and E.

Large catastrophic fires outside the range of natural occurrences can have serious negative impacts to wildlife habitat, particularly in the short term. Severe wildfires change vegetative composition and can detrimentally burn soils. The effects of this can lead to the establishment of undesirable early successional plant species, including noxious plants such as knapweeds and thistles. Although certain of these non-native plants provide forage and nesting material for a variety of birds, they threaten the composition and function of native ecosystems and can reduce forage for many wildlife species, particularly big game. Alternatives that emphasize nonmotorized recreation or allocate land to core areas will affect the fire suppression program by reducing response times. This will result in a greater risk of small fires growing in size and intensity. Alternatives B and F would pose the greatest risk of undesirable large catastrophic wildfires.

Effects from Fisheries Management - The management of fish habitat normally consists of instream structural or riparian habitat improvements. Normally both of these activities would result in higher quality riparian habitat for associated wildlife species. This would be common under all proposed alternatives.

Effects from Insect And Disease Management - Forest insects and diseases have always been a natural component of the Forest. Along with fire, they are some of the most important agents of disturbance that have created current composition, structures, and pattern of wildlife habitats. The primary insect species is the bark beetle, and the primary diseases include root diseases, dwarf mistletoe, and various aspen stem cankers.

Wildlife that depend on snags or downed woody material benefit most from insect and disease activity. Infrequent epidemic levels of activity often resulted in large stand-replacing fires that were part of the disturbance processes that shaped the current ecosystems on the Forest.

The alternatives do not differ significantly for predicted levels of endemic insect and disease activity.

The less frequent epidemic outbreaks can have negative effects on wildlife habitat in several ways. Some examples include reductions in habitat for late successional and old growth associated species and removal of large areas that provide cover and security for big game.

Timber harvesting and related silvicultural activities can provide an ecological approach to prevention or reduced risk of major unwanted insect and disease outbreaks that can have negative impacts to wildlife habitat. The risk of undesirable outbreaks of insect and diseases can be related to the amount of acreage proposed that has silvicultural treatments. The acres available for timber stand improvements would be greatest under Alternatives D, E, A, and G at the full budget level. The opportunity for treatment would be much less under Alternatives B and F for both the full and experienced budget levels.

Effects from Minerals Management - Exploration and or development of minerals could directly and indirectly affect wildlife through disturbance and displacement of species caused by habitat modification and increased human activity.

Approximately 35% of the Forest is classified as having a moderate to high potential for locatable minerals such as gold, silver, and others. Land management in high potential areas would not vary by alternative and would have very little impact on the number of acres available for mineral entry. The exception is Alternative F which would have more acres withdrawn from mineral entry.

The 1993 analysis completed for leasable minerals on the Forest opened over 607,000 acres of high-to-moderate potential for leasing. An additional 189,400 plus acres of low potential is analyzed in this document, leaving approximately 363,000 acres of nonwilderness lands which are determined to have no potential for oil and gas production. The resource protection stipulations developed for the 1993 analysis have been adjusted to reflect the standards for each of the proposed alternatives.

While implementation and enforcement of these stipulations would avoid most adverse effects to wildlife and wildlife habitat, it is reasonable to assume that alternatives proposing the most acres available for leasing also pose the greatest risk of adverse effects to wildlife. Alternatives A and C would prescribe the most acres open, followed in order by E, G, D, B, and F.

Effects from Range Management - Activities related to domestic grazing can have positive and negative effects to wildlife and wildlife habitat. Positive effects can result when livestock remove and stimulate mature and over mature vegetation, increasing the availability of new regrowth and its nutrient content. Range management treatments and projects, such as fences and water developments, often result in better distribution of livestock, conservation of water sources, and less potential for livestock and wildlife conflicts.

Social interaction and competition for forage, space, and water can occur between wildlife and livestock. Timing and distribution of livestock can effectively reduce or eliminate the majority of these conflicts.

Domestic livestock grazing would continue to be permitted under all of the alternatives. The levels of domestic grazing proposed were analyzed by three categories, depending on the amount of restrictions prescribed. Refer to the range section in this chapter for a complete discussion.

Assuming that those alternatives with the least restrictions would potentially pose more risk of adverse effects and conflicts with wildlife, the alternatives would rank from greatest to least risk as follows: Alternative G, E, A, C, D, B, and F.

Effects from Recreation Management- Some types of recreational activities can result in direct loss of wildlife habitat, disturbance, and temporary or permanent displacement of species. In general, developed recreation sites would not significantly change the composition or pattern of habitat. Effects on wildlife would primarily be associated with increased disturbance from recreationists. Any expansion or construction of new facilities would include a biological evaluation under all alternatives.

Dispersed recreation, whether motorized or nonmotorized, has the potential to disturb and displace some wildlife species. The effects of motorized use and road density on habitat effectiveness and big game hunting have been discussed earlier in this section.

Recreational wildlife viewing and photography have grown significantly in popularity over the last decade. During certain times of the year, wildlife can often be adversely affected by people wanting to view them or take photographs. The potential for stress to wildlife caused by activities such as viewing and photography would be the greatest under Alternative A, followed by C, G, B, D, E, and F. This is based on projections in total recreation user days by alternative.

Research has shown that snowmobile use has the potential to displace wildlife, can result in habitat loss, and can sometimes lead to mortality (Boyle and Samson 1985; Bury 1978, Dorrance et al. 1975). Behavioral responses can be of both short and long duration (Knight and Gutzwiller 1995). Snowmobiling can also damage shrubs and saplings, reduce vegetative standing crop, and create changes in species composition (id.), thus resulting in indirect impacts to species. The greatest impact appears to be on those animals that winter under the snow (subnivean) (Boyle and Samson 1985; Bury 1978).

Snowmobile use would be allowed to occur on nearly 76% of the Forest, although the majority of use presently occurs in the Rabbit Ears area. Snowmobile use is expected to increase in the future (FEIS Figure 3-25; Knight and Gutzwiller 1995). As stated in the Revised Plan (p. 3-3), "The winter ROS classes are motorized and nonmotorized. They can be used to identify areas of high recreation value for motorized versus nonmotorized use and as a guide for managers where there is an identified need to zone winter uses." The ranking of most to least winter motorized acreage is A, C, E, G, D, B, and F.

In lower elevation areas, particularly Management Area Prescription 5.41 (Deer and Elk Winter Range), the ROS class is designated as semi-primitive nonmotorized in the spring and winter. Human activity will be prohibited during the winter and spring periods where conflicts with wintering wildlife are identified (Revised Plan, p. 2-49).

Few studies show a good understanding of the direct and indirect effects of recreational disturbance on wildlife (Knight and Gutzwiller 1995). Most studies have focused on overt behavioral responses. Minimal information or research exists that addresses possible impacts at the population or community level (id.). Forest Plan standards exist which will help reduce impacts from recreational activities for some wildlife species (eg., elk calving and winter range areas, caves, protection of known active and inactive raptor nests and buffer areas) (Revised Plan, p. 1-14). Monitoring (Revised Plan, Chapter 4) will determine any site-specific changes necessary to future snowmobile use.

Effects from Road Management - Roads can impact wildlife species by direct removal of habitat during construction and reconstruction or indirect loss of habitat associated with increased human use and disturbance associated with the use. This loss is greatly reduced when roads are obliterated. Generally those alternatives proposing the fewest miles of road pose the least risk to sensitive species and their habitat. Alternative F proposes the fewest miles of roads, followed by Alternatives B, C, D, G, A, and E.

Effects from Timber Management - The direct effects of vegetative management, especially timber harvest, would be an immediate change to the structure and often the composition of the treated area. Timber management can result in positive and negative effects on wildlife.

In place of the decreased levels of historical disturbance agents such as fire and insects and diseases, timber management can help retain the diversity of habitats and vegetative composition, structure, and pattern. All alternatives, except Alternatives B

and F, allocate land to be managed for forest products in Management Area Prescription 5.13.

Timber management and related roading can also result in loss of habitat effectiveness and increase wildlife disturbance and displacement (see discussion earlier in this section for disclosure of predicted effects by alternative). Cutting of dead trees and snags for firewood following logging can affect the availability of cavities for nesting and security, for snag dependent species. The standards and guidelines proposed under all alternatives would require a minimum level of snags and downed woody material.

Cumulative Effects

Some effects or impacts on wildlife and their habitat on the Routt National Forest which have occurred over the past decade or so include timber harvest and road construction, rural development, increased recreational use, and other human activities by the public and land management agencies. The Forest Service has no direct control over the effects to wildlife from sub-dividing and developing private lands.

The total Forest composition, structure, and pattern of wildlife habitats would be slightly altered through implementation of the alternatives. As an example, the forestwide acreage of late successional spruce/fir habitat would vary less than 3% over the short term or long- term under any of the proposed alternatives. Effects of implementation of the alternatives would have less effect on habitat composition when analyzed at the section and province levels. Spruce/fir cover type at the section level (M331H & M331I northern CO and southern WY) would change less than 1%. Projected changes for other habitats at the forest, section, and province level would be similar for the levels of permitted management activities under all of the proposed alternatives.

Under all the alternatives, habitat effectiveness for big game would decrease with increases in road miles. Increased road miles on the Forest, combined with roads on adjacent public and private lands, could have effects on wildlife disturbance and displacement and on habitat fragmentation. Alternatives proposing the greatest increase in total road miles would have the greatest risks for negative impacts to wildlife. Implementation of Alternative E requires the greatest amount of roading, followed by A, G, D, C, B, and F at the full budget level.

The presence of many of the migratory species, such as Neotropical birds, is partially related to diversity and distribution of Forest habitat. For these migratory species, habitat on their winter ranges are as important as summer breeding habitat for maintenance of viable populations. Management requirements and mitigation requirements proposed in the Revised Plan can do little by themselves to compensate for loss of habitat on non-Forest Service System lands in the United States or losses of habitat in other countries. Forest Service participation in programs like Partners in Flight have helped preserve habitat of migratory birds in Mexico and other Latin and South American countries. Wildlife habitat improvement projects implemented on the Forest can cumulatively help compensate for losses of habitat outside the Routt National Forest boundary. Alternatives F and B would provide the greatest opportunities for wildlife partnerships and replacement migratory bird habitat, followed by Alternatives C, D, E, A, and G. This is due to the loss of riparian or other critical habitat on non-Forest Service lands.

For wildlife species that are subject to hunting (deer, elk, black bear, etc.), state regulatory mechanisms such as population objectives, harvest objectives, and lengths

and types of harvest seasons are an important role in population ecology and species distribution on the Forest.

Reasonably foreseeable actions will likely remain similar to present: timber harvest and road building, increased recreational use, continued development of rural/forest interface, possible ski area expansion.

This analysis does not expect that implementation of any of the proposed alternatives would result in substantial cumulative effects to wildlife. This would be true under either the experienced or full implementation budget levels.

Uses and Designations of the Forest

- Lands
- Recreation
- RNAs
- Roadless Areas
- SIAs
- Travel Management
- Visual Resources
- Wild and Scenic Rivers
- Wilderness

Lands

Introduction

This section addresses those aspects of Forest Service management relating to land ownership, special uses such as electronic sites, utility corridors, and rights-of-way.

A large portion of what is now the Routt National Forest was established by presidential proclamation in 1905. The current Forest also has administration of the Middle Park District of the Arapaho-Roosevelt National Forest. Approximately 90% of the land within the boundary is under federal ownership, with the other 10% being accounted for by patented mining claims, scattered private lands, and Colorado State Forest.

Legal and Administrative Framework

Several laws authorize use and occupancy of the National Forest, including:

- **Act of 1866 General Mining Law** - authorizes rights-of-ways across public lands for ditches and roads.
- **Act of 1891 An Act to Repeal Timber-Culture Laws** - authorizes ditch easements across public lands and Forest Reserves.
- **Act of 1897 Organic Act** - provides for the making of rules to regulate occupancy and use of the Forest Reserves.
- **Act of 1905 Transfer Act** - transferred Forest Reserves to the Department of Agriculture.
- **Act of 1922 General Exchange Act** - authorizes land adjustments within Forest boundaries.
- **Act of 1976 Federal Land Policy and Management Act (FLPMA)** - updated authority for management of National Forest Lands. General authority for use and occupancy of Forest Lands. Required fair market value for uses on the Forest. Repealed sections of many previous acts.
- **Act of 1986 Ditch Bill** - amendment to FLPMA to authorize permanent easements for agricultural water systems.

Key Indicators

- Acres of land exchanged.
- Number of rights-of-way.
- Number of special-use permits.
- Miles of utility corridors.

Land Ownership

Acreages under administration by the Routt National Forest include portions of the Arapaho National Forest and are shown in Table 3-50. These figures are from the Land Status Database and are different from the GIS acreage figures used throughout the analysis, although National Forest Service lands are within one half of one percent.

Table 3-50. Land Ownership

Land Ownership	Acres (1996)
National Forest Service lands within Proclamation Boundary (Routt N.F. Only)	1,121,931
National Forest Service lands within Proclamation Boundary (Arapahoe/Roosevelt N.F, Administered by Routt N.F, Troublesome and Gore Areas)	129,325
National Forest Service lands within Proclamation Boundary (Arapahoe/Roosevelt N.F, Williams Fork Area)	104,744
Other lands within the Forest boundary	138,200
Totals	1,494,200

Source: Region 2 Land Status Database

Approximately half of the nonfederal lands within the Forest boundary belong to the Colorado State Forest in North Park. This is the result of a trade in 1938 for 70,000 plus acres of scattered state lands within National Forests of Colorado.

Land Ownership Adjustments

From 1983 to the present, land adjustments have been completed as shown in Table 3-51.

Table 3-51. Land Ownership Adjustments

Type of Adjustment	Gain (acres)	Loss (acres)
Purchases	40	
Sales		6
Exchanges	5,760	2,351
Donation	160	
Small Tracts Act (Sales)		3
Totals	5,960	2,359

Most of the funding for purchases are from the Land and Water Conservation Fund. This is a very competitive national fund and therefore not readily available for land purchases. Most of the adjustments in the future will be accomplished with exchanges.

Special-Uses

Occupancy and use of National Forest System lands by federal, state, and local agencies, as well as private industry and individuals, are authorized with special-use permits. Several different public laws regulate activities under special-use authorizations. The Organic Act of 1897 and the Federal Land Policy and Management Act (FLPMA) of 1976 authorize the majority of the uses.

The major law passed since the 1983 Plan is the 1986 amendment to FLPMA known as the Ditch Bill. This law provides for permanent easements for agricultural water systems in use before 1976. Water users had 10 years from passage of the bill to make application for existing structures located on National Forest System lands. Currently,

50 easements have been issued under this law with an estimated 100 additional applications being processed.

Special land use applications are increasing as more people make use of National Forest lands. Prior to 1960, there were 43 permits issued on the Forest. From 1960 to 1969, there were 57 and 162 from 1970 to 1980. Currently there are 375 permits and easements being administered on the Forest. Table 3-52 lists the number of permits by type and acres and miles involved as of June 1997.

Table 3-52. Number of Special-Use Permits (other than Temporary) by Type

Special - Uses	Number of Permits	Acres	Miles
Powerlines	8	110	90.0
Road permits	16	66	40.0
Ditches	93	306	117.0
Communication permits	32	5	
Dams and reservoirs	45	2,287	
Recreation residences	21	14	
Buildings	0	1	
Oil and gas pipelines	1	38	16.0
Water treatment plant	1	2	
Liquid waste disposal area	1	4	
Sanitary system	1	1	
Ski area	2	7,328	
Telephone lines	5	7	22.0
Pastures	4	299	
Water pipelines	6	3	1.5
Wells or spring developments	8	2	
Stream gauging stations	3	1	
Research areas	1	1	
Outfitter/Guides	105	87	
Recreation events	11	80	
Organization camps	2	22	
Fences	1	1	1.0
Other improvements	8	62	
Totals	**375 Permits**	**10,726 Acres**	**287.5 Miles**

Source: FLUR (Forest Land Uses Report)

Recreation Residence Permits

There are four summer home groups with a total of 29 cabins located on the Forest and one isolated cabin tract. Use in many of the areas has existed since approximately 1917. Permits for the recreation residences are issued for a period of 20 years. The purpose was to encourage use of the National Forests by allowing individuals to build cabins and occupy them for a portion of the year. The program was successful and several thousand permits were issued nationwide. The current national policy is not to issue any additional permits.

Access

Lack of public access to the Forest is a growing problem as the demands to use the Forest increase. Private landowners adjacent to Forest boundaries often enjoy nearly

exclusive use of the Forest through control of the access. In many cases, this is the reason they purchased those lands. These landowners are reluctant to grant access to the public.

The Forest has gained access to 43 roads and trails since 1983. Fifty-one additional cases have been identified as being needed to provide basic access to the Forest.

Direct and Indirect Effects

Land Adjustments

Over the last 10 years, the Forest exchanged 2,351 acres and acquired 5,760 acres. Of the acquisition, 2,119 acres was from one exchange in which the Bureau of Land Management exchanged lands under their jurisdiction.

There are approximately 70,000 acres of private lands within the Forest. Of this, approximately 30,000 acres would be suitable for acquisition under the guidelines established for the land adjustment analysis. It is estimated that less than one-third of the suitable acres would be available for exchanges. Land adjustments are based on a willing seller concept. The landowner must be willing to exchange lands at the appraised value. Very little of the existing National Forest System lands on the Forest has been identified as meeting the criteria to be exchanged out of federal ownership. Exchanges are evaluated based on the guidelines shown in Appendix F of the Revised Plan.

Ten exchanges with potential for completion have been identified under alternatives A and F. These will account for a maximum of 3,500 acres to be acquired, but only 500 acres of Forest lands are to be exchanged. This type of exchange program is very dependent on other federal lands being available for exchange. In addition, funding levels established during the annual budget process can affect the number of exchanges processed.

In Alternatives B, C, D, E, and G, the number of exchanges would be greater than described for Alternatives A and F because of the 10,000 plus acres in the residential/Forest interface management area prescription. The standards and guidelines for this management area prescription encourages consolidation of ownerships. Many of the exchanges would be small. Several detailed land adjustment plans would need to address the smaller acreages in and around the private and Forest lands in these areas.

Recreation Residences

At the current time, no other uses have been identified for the areas occupied under permit for the recreation residences. Future use determination would be to continue the permits in all alternatives until such time as conditions change. Each permit and tract would then be evaluated. No permits for additional uses will be approved. Exchanges for the recreation residence tracts will be pursued as the opportunity presents itself. Exchange would be in agreement with all permit holders for each tract.

The one isolated cabin site on the Forest is issued under a life estate permit. That is, it will expire when the current permittee dies. It will not be re-issued at that time and will not be transferred to anyone else. All improvements will be removed and the site restored.

Utility Corridors

Utility corridors are shown in Figure 3-23. The areas designated as utility corridors are also found on the management area prescription maps for each alternative, and do not change by alternative. Corridor management shall comply with adjacent management objectives. Expansion and other activities and actions that would not meet these requirements would not be approved. The corridors are set in width as identified by the special-use permit issued. Corridors are only designated for transmission lines over 69 kv and for pipelines over 10 inches in diameter. Local distribution lines and smaller pipelines have not been identified as corridors. Table 3-53 describes the existing uses of each utility corridor and the number of miles.

Table 3-53. Utility Corridor Uses and Mileage

Utility Corridor	Use	Total Miles
Hayden-Archer & Craig-Ault	230 kv transmission line and one 345 kv transmission line	14.88
Hayden-Blue River	345 kv transmission line	30.84
Williams Fork Henderson	One transmission line	11.69
Tri-State	One transmission line	1.13
Ute Pass Corridor	One transmission line and one gas line	1.14

Source: GIS (ARC/Info), utility layer

See the glossary for a definition of utility corridors. Also see the Management Area Prescription description for Utility Corridors (8.3) in Chapter 2 of the Revised Plan.

Electronic Sites

Electronic sites are identified in Table 3-54. Any additional sites for commercial and Forest use will require the approval of a site plan. The site plan specifications must demonstrate compliance with visual quality and other resource management objectives. The number of electronic sites does not change by alternative. See Figure 3-24 for the location of current electronic sites.

Table 3-54. Electronic Sites		
Site*	Used by Forest Service	Other Users
Mount Werner	Yes	Yes
Buffalo Pass	Yes	Yes
Blue Ridge	Yes	Yes
Grouse Mountain	Yes	Yes
Rabbit Ears Divide	Yes	Yes
Farwell Mountain	Yes	Yes
Green Ridge	Yes	Yes
Sand Mountain	Yes	No
Dunckley	Yes	Yes
Walton Peak (south)	No	Yes
Walton Mountain	No	Yes
Black Mountain	No	Yes
Thunderhead	No	Yes
Cedar Mountain (off Forest)	Yes	Yes
San Toy Mountain (off Forest)	Yes	Yes
Juniper	Yes	Yes
Independence Mountain (off Forest)	Yes	Yes
* *Parkview	Yes	No

* Additonal sites will require site specific NEPA analysis.

* *This site was established too late to be included on maps. It is located on Parkview Mountain.

Source: FLUR (Forest Land Uses Report)

Rights-of-Ways

Since 1983, 43 rights-of-way (ROWs) have been acquired. The ROW inventory currently has identified 51 more to be acquired. These additional ROWs are necessary to provide basic public access to the Forest.

The readily obtainable ROWs have been acquired. The remaining ROWs needed are more complex. An estimated 30 ROWs may be reasonably available for all alternatives, except for Alternative F.

Due to the limited emphasis on timber and recreation in Alternative F, existing access routes are sufficient.

Cumulative Effects

There are no known cumulative effects.

Recreation

Introduction

The Routt National Forest is within driving distance of Denver and the surrounding metropolitan area, but recreation use levels are buffered by other opportunities adjacent to these 3 million residents. The Arapaho/Roosevelt and Pike/San Isabel National Forests, Rocky Mountain National Park, state and local parks, and open space provided by the BLM all serve as options for people with limited time. Demand for activities common to wildland recreation increased faster than the overall population in 1994 which may indicate a growth in interest in recreation well into the future (1994 RIM Report; Denver Post 1995; National Survey on Recreation and the Environment (NSRE) 1997).

"Achieving a balance between preservation and utilization is one of the most difficult challenges facing resource managers " (Jackson 1987). It has only been recently that the Forest Service managers viewed recreation opportunities as anything more than "an inconsequential by-product of vast areas of public land available for unconstrained access and recreation use" (USDA Forest Service 1992d). Demand for open space is increasing, and supplies are not inexhaustible. Communities are becoming creative in finding ways to secure more open space within the sprawl of an urban population using conservation easements, urban parks, and greenways. But, according to English, et. al. (1993), Americans still have traded undeveloped backcountry areas at a rate of 5% per year for development (6% per year).

Research has shown that different levels of recreation demand depend on users' expectations and prior experiences; where they live; the availability of recreation resources close to home; basic demographics such as age, gender, and life-style; leisure time available; and their level of expertise in certain activities (Chavez 1990; Recreation Roundtable 1996, President's Commission on Americans Outdoors (PCAO) 1986; Ewert and Knopf 1989; Ewert, et al. 1994; Ewert, 1995; Ramthun 1995).

While the Forest Service is embracing the concept of visitors as "customers" in the 1990's, people who visit the National Forests see themselves as owners, part of a community that values the resource in ways other than just economically (Schroeder 1995). As members of this community, Schroeder suggests people relate through deeper feelings of belonging and interdependence. Today, the objective of Forest Service interpretation appeals to these deeper feelings of belonging that users have; the emotional, symbolic, and spiritual values that aren't quantifiable, but are most important to them.

As visitors become more attached to specific areas or types of environments, conflicts can arise. Conflicts are a concern for managers, but they can also be an indication of the multiple values placed on specific settings. While some visitors prefer activities which require higher levels of development, others see development as a threat to the future of the resource (Jackson, 1987). The Routt National Forest provides for both of these user preferences.

Technology has assisted us in experiencing the elusive thrill of wildland recreation. Mountain bikes, better skis, more powerful recreational vehicle engines, hang gliders, warmer clothing and gear that can withstand severe mountain climate conditions, and commercial enterprises all contribute to our ability to do more, achieve more, and have more fun. These innovations are also a source for conflict among recreationists. Backcountry hikers are shocked to see mountain bikes in areas they once considered

exclusively theirs. But the shock of seeing more recreationists is nothing compared to seeing a logging operation in the middle of what was expected to be a remote backcountry area.

In 1957, S.T. Dana pointed out that: "... recreational use of the National Forests brings the Forest Service into direct contact with many more people than all other uses combined. This fact emphasizes the opportunity to render an important service to large numbers of people, whose judgement of the efficiency of the Forest Service as a multiple-use land management agency will depend largely on the effectiveness of that service."

The recreation topic of this Forest's plan will attempt to address these problems by providing for current and traditional uses and investing in the future. Managers will be more responsible for having communication skills and understanding and accepting seemingly conflicting viewpoints over forest management. Resources will also be invested in making areas safer and more friendly for an increasingly more diverse population.

Legal and Administrative Framework

- Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201).
- Multiple Use Sustained-Yield Act of 1960 (74 Stat 215; 16 U.S.C. 528).
- Wilderness Act of September 3, 1964 (78 Stat 890; 16 U.S.C. 1121).
- Land and Water Conservation Fund Act (Act of September 3, 1964) (16 U.S.C. 4601-4).
- Architectural Barriers Act (Act of August 12, 1968).
- National Trails System Act (Act of October 2, 1968).
- Forest and Rangeland Renewable Resource research Act of 1978 (16 U.S.C. 1600).
- Americans with Disabilities Act (Act of July 26, 1990).

Key Indicators

The key indicators for this revision topic are:

- The range of opportunities based on the recreation opportunity spectrum (ROS).
- Determination of changes in opportunities offered, given alternative themes.

Resource Protection Measures

Mitigation measures to reduce or prevent significant effects of developed and dispersed recreation on the resource are outlined in the standards and guidelines for recreation and other resource activities.

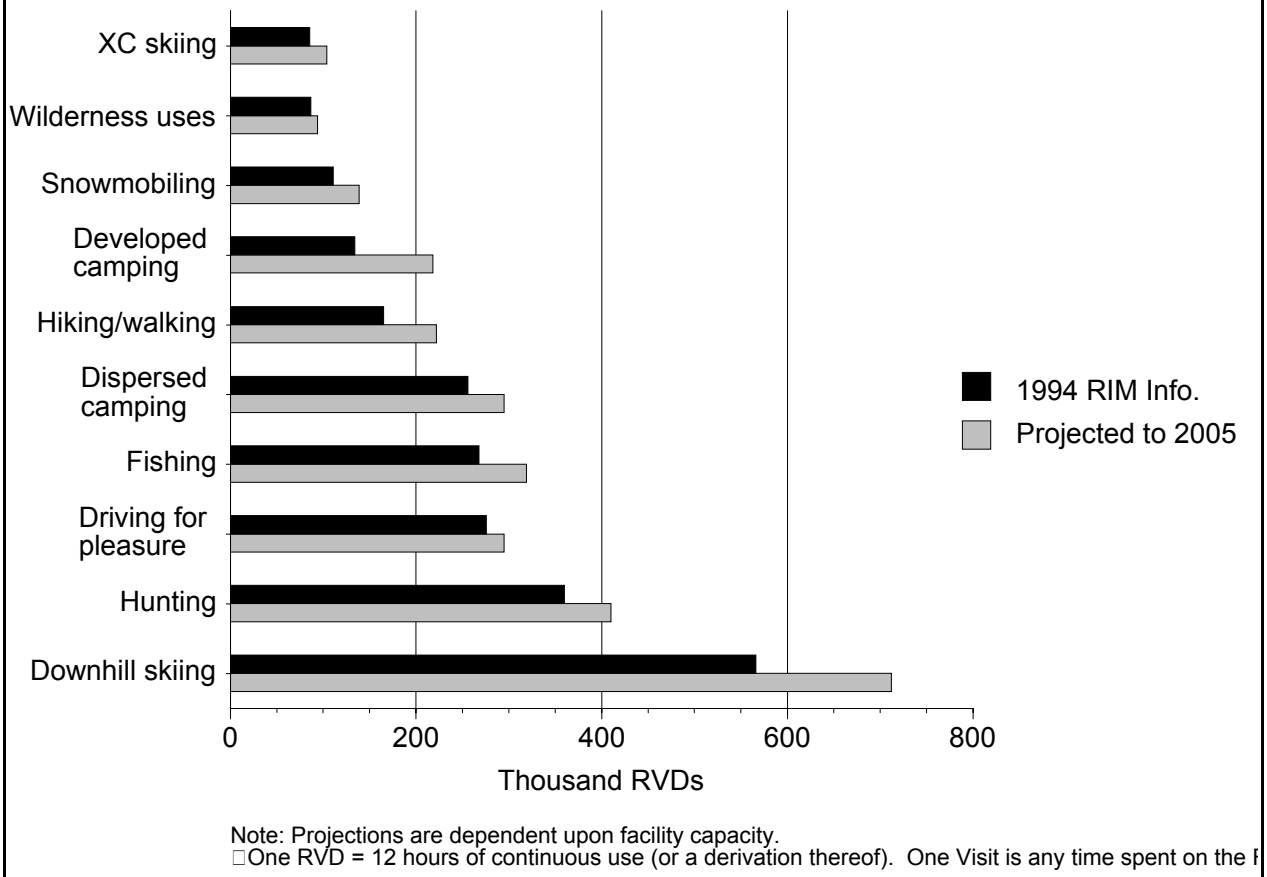
Affected Environment

The Routt National Forest is located in northwestern Colorado less than 150 miles from metropolitan Denver and the surrounding communities. It is bounded by three other National Forests, two National Parks, one Colorado State Forest and three state Parks all surrounded by BLM lands. With the exception of the National Parks, these areas provide additional open space recreation within 5 miles of the Forest.

Forest attractions include an internationally famous world class ski area and associated mountain resorts, whitewater rafting, quality dispersed opportunities, abundant wildlife, spectacular mountain scenery, and wilderness solitude inside and out of designated wilderness areas.

The Forest received an estimated 7.3 million visitors in 1994, an increase of 24% since 1991 (RIM 1991-1994). Figure 3-25 illustrates the activities for which most visitors come to the Forest. Downhill skiing is the most popular activity, with an anticipated 1.2 million visitors in 1995-1996. Similarly, driving to view scenery and wildlife recreation are also popular destination activities.

Figure 3-25. Ten Dominant Recreation Activities on the Routt National Forest (1994 and 2005)



Note: Projections are dependent upon facility capacity.
One RVD = 12 hours of continuous use (or a derivation thereof). One Visit is any time spent on the F

Source: Recreation Management Information Report, 1994

Recreation Setting

A primary objective of outdoor recreation resource management is to provide and secure an environment for visitors to achieve a satisfying experience, which can be described in a zoning process called the Recreation Opportunity Spectrum (ROS). The assigned desired condition ROS class is the maximum level of use, impact, development, and management that an area should experience over the life of the plan. The ROS is not prescriptive; rather it is the manager's tool for identifying, and mitigating change. There are seven ROS classes on the Forest; Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized, Roaded Natural, Roaded Modified, Rural, and at the base of Steamboat Ski Area, Urban.

The ROS illustrates the spectrum of activities and experience opportunities visitors may have, within a range of outdoor settings. This range is measured by remoteness, user densities, and management types and levels which characterize the area. The developed (urban, rural, and roaded natural) end of the spectrum is generally associated with campgrounds, road corridors, and ski areas and base facilities. The primitive end, including semi-primitive settings, includes areas where visitors can expect to use more technical survival skills and have a more solitary experience.

There are three basic components to the ROS - the physical, social, and the managerial settings. The physical setting can be characterized by distance from roads, size of the area, and proximity from other management activities. The closer an area is to roads, the greater the likelihood that visitors will encounter each other and noise levels will be higher. A large (2,500 acres or more), non-roaded setting would provide a more solitary experience. Well-maintained roads provide access to more users. Facilities management is concentrated in areas at the developed end of the spectrum.

The social setting is a measure of use levels, use patterns (frequency combined with use levels), and vegetation in the area. Fewer people are visible in a heavily timbered area because trees and other vegetation provide covering. The absence of trees lowers the carrying capacity. Higher uses can be expected along developed highways and in developed facilities, especially on weekends. Weekday use levels are expected to be lower.

The managerial setting reflects the amount and kind of management in an area. Campgrounds are much different in a rural setting than in a semi-primitive setting. Logging can be intrusive in a roaded natural or semi-primitive setting, but the impact is short term. Subtlety, scale, frequency, and duration of the management activity are part of this measure. On-site information is more appropriate at the developed (or rural and urban) end of the spectrum. By contrast, information is designed to blend into the setting and provide subtle control at the primitive end.

The Desired Condition ROS

The amount of change that will be allowed is a reflection of the desired condition ROS classification. Primary consideration is given to current use levels, the relative availability of opportunities for each use, and their location on and around the Forest relative to access points and other management activities. Some settings may seem to be inconsistent with management objectives. For this reason, the Desired Condition ROS is developed to be consistent with other forest management. User conflict is a typical recreation issue that can be dealt with in the ROS.

Developed Recreation

The Forest currently provides 420 campsites in 33 campgrounds, 193 picnic sites in 10 picnic grounds, 113 developed trailheads, 1 major ski area, and 2 major interpretive sites. The Forest can facilitate 1.5 million visitors in developed facilities, other than the ski area. Most facilities are 30 years old and in need of major repairs.

Use in developed facilities is currently at 40% of developed capacity and is expected to increase. There are limitations to development of facilities, and use could potentially reach 100% of built capacity by 2015 (USDA Forest Service, 1995). These use estimates assume all visitor barriers and costs will remain constant. The current backlog in maintenance and rehabilitation is estimated at $11 million.

Heavy maintenance, such as toilet, table, and grill replacement, is less likely to be accomplished as annual appropriations of funds are steadily decreased. The current capital improvement process includes the projects listed in Table 3-55. Improvements will include new toilets, road resurfacing, some new campsite developments, new drainage systems throughout, accessibility planning for visitors with special requirements, and new campsite furnishings. Funding is expected over the next decade.

Table 3-55. Capital Investment Projects

Project Name	District	New/Recon	*Cur PAOT	Added Capacity

Fish Crk Rd	Hahns Peak	Recon	0	0
Fish Crk Rec	Hahns Peak	Recon	100	56
Hahns Pk Lk (CG)	Hahns Peak	Recon	190	100
Hahns Pk Day	Hahns Peak	Recon	40	50
Bear River	Yampa	Recon	60	20
Bear Lake	Yampa	Recon	150	155
Bear River Rec	Yampa	Recon	N/A	N/A

* Current Capacity = 5 people at one time per site
Source: Forest CIP coordinator, personal contact

Downhill Skiing

Downhill skiing accounts for 18% of all recreation use on the Forest. During the 1993-94 ski season, there were 1,021,149 skier visits at the Steamboat Springs Ski Area. This is an increase from the 1983-84 season, which had a total of 839,200 skier visits. The comfortable carrying capacity approved in the current Master Plan is 13,200 skiers at one time or 2.1 million during an average 160 day season. English, et al. (1993), estimates that demand for snow skiing opportunities (cross country and downhill) will increase by more than 200% by 2040. The recent ski area expansion to include Pioneer Ridge and Morningside Park added 958 acres of National Forest land to the existing ski area permit boundary.

Summer recreation use of the ski area is growing and was not identified in the 1983 Plan. Mountain biking, hiking, and interpretation are all popular uses of the ski area in the summer. Summer use is measured by tickets sold to gondola riders and exceeded 50,000 for the summer of 1995.

In addition to the Steamboat Ski Area, Lake Catamount Resort is presently under special-use permit to develop a new ski area and all-season resort on both private and National Forest System lands. The master planning phase of the resort and ski area development is underway, but approval of the master plan has not been given. Additionally, the Lake Catamount developers have postponed implementation while financial strategies are redeveloped. The special-use permit will be reviewed in 1998 if final master plan approval has not been reached and construction of the first phase of development has not begun.

Special-Use Administration

The Land and Water Conservation Fund Act of 1965 provides the principle authority to issue and administer outfitter and guide and other special-use permits on National Forest System lands. Recreational special-use activities give visitors the opportunity to experience new recreational pursuits without the cost of equipment or logistics involved in planning the trip. They are also the Forest Service's link to the public, providing quality service to people who may not normally venture into the forest alone as well as providing valuable educational opportunities. Permits can provide the Forest with a mechanism to control use in areas where uncontrolled use would be damaging to the resource. Table 3-56 is a compilation of the recreation permits administered during the 1996-1997 calendar year.

Table 3-56. Recreation Special Uses by Type and District

District	Special Use Type Permitted	Number	Dollars Collected
Yampa	Recreation Residence	3	$ 2,031
Yampa	Recreation Event	3	$ 165

Yampa	Outfitter and Guide	25	$ 26,123
HPBE	Recreation Residence	4	$ 4,072
HPBE	Recreation Event	8	$ 4,849
HPBE	Outfitter and Guide	66	$ 78,626
HPBE	Winter Recreation Resort	2	$760,656
HPBE	Other	3	Not available
Parks	*Recreation Residence	14	$ 11,051
Parks	Recreation Event	2	$ 365
Parks	Outfitter and Guide	27	$ 15,568
Other	Other	1	$ 75

* Does not include 9 recreation residences in the Williams Fork section of the Arapaho/Roosevelt National Forest which had been managed by the Parks District of the Routt N.F.

Source: 1996 Workload Analysis for FY97 Budget and Forest Land Use Report (FLUR) database

Dispersed Recreation

Dispersed recreation is defined as "those forest, range, or desert-oriented outdoor recreation activities that normally take place outside of sites or areas that are developed or managed to concentrate recreational use. Dispersed recreation activities may require facilities for safeguarding visitors, protecting resources, and enhancing the quality of visitor experiences" (Shafer, et al. 1979). Dispersed recreation, by definition, can essentially occur anywhere on the Forest. Use typically occurs in general forest land areas within 0.5 miles of roads and trails and along shorelines (Cordell, et al. 1990).

The quality of the dispersed recreation program on the Routt National Forest is important to the whole Colorado outdoor experience. The Routt is a destination area for the urban population surrounding Denver and for residents on the northern plains. Dispersed recreation accounts for roughly 68% of all use that occurs on the Forest. According to a study done by RRC Associates in 1991, nearly half of the visitors to northwest Colorado are repeat visitors with previous fall and winter visits.

The forested environment provides solitude, fresh air and water, and spiritual renewal; things that aren't available in a developed setting or a park. Most return visitors find a special area to which they return time and again. This is known as setting attachment; choices are made based on a feeling an area can provide (Williams, et al. 1992). As more visitors discover and explore these sites, resources become impacted. This is the "love the area to death" phenomenon that resource managers refer to.

Of the few studies which give dispersed recreation priority, information primarily emphasizes the concept of carrying capacity, and the ROS is one area in which the social and resource issues are addressed (Graefe, et al. [no date]). Lakes and streams receive the bulk of the use because everyone wants to be near water. Resource damage from use depends on the amount of dispersal opportunities provided by roads and trails, the time of year (hunting can only occur in the fall, for instance), and on weather conditions. Large numbers of users along a stream create more resource damage in the early spring than in the dry months of summer.

If use is impacting the resources, managers step in and provide a modified developed site using soil stabilization techniques, site closure, or designation. One of the concerns over closing sites is that this simply displaces users to another area. If the site has been heavily impacted, it could take years to recover even if it's unused (Cole 1994). Overwhelmingly, recreation managers cite the need for funding for a successful

dispersed recreation program. At the desired condition level, Alternative B emphasizes a dispersed recreation budget, followed by F, C, D, E, A, and G.

The sections that follow outline specific types of dispersed activities, their availability, and trends.

Trails and Trailheads

There are 922 miles of trail on the Forest, accessed by 113 trailheads. Eight hundred and twenty miles (820) are on the Routt, and 102 miles are in the Williams Fork portion of the Arapaho/Roosevelt National Forest. One hundred ninety two (192) miles are motorized, 453 are nonmotorized outside wilderness, and 277 are nonmotorized inside wilderness (see Table 3-57). In 1990, the Forest reported a $2.4 million shortfall in trail maintenance funds. Lower-than-average funding levels since that time have necessitated a proactive approach to seeking partners to assist in trail project planning, maintenance, and construction.

Table 3-57. Trail Opportunities

Trail Type	Wilderness		Outside Wilderness		Total	
	Routt	Williams Fork	Routt	Williams Fork	Routt	Williams Fork
Motorized	0	0	192	0	192	0
Nonmotorized	224	53	404	49	628	102
Total	224	53	596	49	820	102

Source: Region 2 Transportation Features (R2TF) database, 1996

The Forest Service vision for the trail system is one where visitors have a variety of outstanding access opportunities - on skis, bicycles, motorcycles, snowmobiles, jeeps, foot, or horseback. These opportunities connect internally to provide access to and within the National Forests and with areas outside the forest boundary. By providing access, these trails can be used by local communities and to build tourism and outdoor recreation economies.

The first priority for the trails program is to meet visitor needs and protect the resource from resource damage due to improper use and poor trail maintenance. The second priority is to plan for outstanding trail projects to enhance existing opportunities and provide new ones where optimal. The third priority is to close obsolete and marginal trails that are causing resource damage.

Trail use does not account for a large percentage of total use on the Forest. Use is measured in 12-hour Recreation Visitor Days (RVDs), and most trail use is frequent, but for short durations. Local citizens use the trails more than 'tourists' for a variety of uses year round. According to the supporting documents for the USDA RPA (Cordell, et al. 1990), day hiking can be expected to increase 193% by 2040.

The 1991 Colorado Statewide Comprehensive Outdoor Recreation Plan (SCORP) for the area around the Routt National Forest indicates a future need for opportunities for jogging, walking, nature study, hiking, mountain biking, and cross country skiing with an expected gap between supply and demand. Nationally, trail uses with the largest expected gap by 2040 include: backpacking, cross-country skiing, horseback riding, bicycling, off-highway vehicle (OHV) riding, and day hiking (Cordell , 1993).

Hikers travel an average 96 miles one-way to get to the trail, and motorized trail users average 77 one-way miles to use the trail system (Daigle, et al. 1994). Seventy percent (70%) of Colorado residents say they use trails for nonmotorized activities, but with the availability of local trail systems in their communities, only 21% use federally provided

trails (Ciruli Associates 1996). As the baby boom generation ages, their use of trails will most likely increase, due to the propensity of the aging population to use trails well into their post-retirement years (Dwyer 1994), especially after they discontinue high-risk activities.

The mountain bicycle is popular as a new form of trail use. The average mountain biker in the Rocky Mountains takes 39 mountain biking trips per year. Nationally, bicycling has the second highest growth potential among trail uses, with an expected increase of 122% by 2040 (Dwyer 1994). Mountain biking opportunities are provided on all trails, motorized and nonmotorized, unless otherwise specified.

Currently, only a small percentage of the trails accommodate a growing market; users with special needs. Standard Forest Service trail widths and grades do not accommodate the needs of this population. The 1997 National Survey on Recreation and the Environment (NSRE) found that between 20 and 24% of Forest Service visitors with disabilities report that their visit would have been enhanced by wheelchair access, the availability of power scooters, and large print brochures (Cordell et al. 1997).

As noted above, an increasing population served by day use trails is the 55-and-older age group. Fifty five percent of them are walking for fitness, regardless of income (Cordell et al. 1997). This group prefers accessible short distance trails which they use more frequently than their younger counterparts because they have more free time (Gobster 1990).

Although off road vehicle use increased 42.8% between 1982 and 1995, future growth rates are expected to slow down to 21% between now and 2040 as the baby boomers begin aging toward retirement. OHV use is greatest among users 25-39. Users in this age group average nearly 19 OHV trips per year (Cordell, et al. 1997).

Motorized trail opportunities are most feasible on two-track roads developed for other management activities. For example, old skid trails that are no longer useful for logging are now being considered for use as a motorized trails. This type of strategy will continue to be a priority for forest recreation managers. Motorized trail use occurs in any motorized ROS class but is most consistent with the semi-primitive motorized class.

The Continental Divide National Scenic Trail

The Continental Divide National Scenic Trail (CDNST) is a national priority trail running along the Continental Divide from Canada to Mexico. The trail provides some of the country's most scenic vistas. It divides the Forest along the crest of Mount Zirkel Wilderness and into the Williams Fork area, a total distance within the Forest boundary of approximately 113 miles. The trail provides nonmotorized and some motorized opportunities.

In 1993, a decision was made to provide four additional trailheads on the CDNST: along the Elk River (Seedhouse Road) and at Buffalo Pass, Muddy Pass and Troublesome Pass. For more information on the CDNST, consult the Final Environmental Impact Statement for the CDNST in Colorado and Wyoming.

Water-Related Recreation Opportunities

Recreationists are drawn to streams and lakes. Estimates indicate that by the year 2040, stream and lake swimming will have become dominant day-use activities, and supply will keep up with demand (Cordell, et al. 1993).

There are 20 water-based recreation sites on the Routt National Forest that are considered to be of high recreation value (see Table 3-58). These sites were inventoried as part of the watershed condition assessment in 1997. It is important to remember that this list does not prevent other sites from being added at a later date. This is not a priority listing, either. All sites on this table are important to both the aquatic and recreation resources on the Forest. A change in this listing would not necessitate a forest plan amendment.

Table 3-58. Currently Inventoried High Value Recreation Areas

Site	Site Value
Freeman Reservoir	High rec use; only lake and campground close to Craig and Baggs, Wyoming
Slater Creek Falls	Unique feature in high use for that area with limited public access.
Middle Fork of the Little Snake Canyon and Falls	Inside a recommended special interest area
Hahns Peak Lake	High use area on paved county road near Steamboat Lake State Park, boating, fishing, camping, day use
North, Middle, and South Forks of Elk River	Nominated for Wild and Scenic River designation
Big Creek Lakes	High use rec area, boating, fishing, canoeing, picnicking, camping, ice fishing, access trail to Mount Zirkel Wilderness, inside a concessionaire-managed campground
North Platte River	High use rafting, quality fishing inside Platte River Wilderness
Spring Creek	High use, just outside Steamboat Springs
Summit Lake	High visibility, high use on the Continental Divide National Scenic Trail, main access to Mt. Zirkel wilderness.
Teal Lake	Scenic high mountain lake near Mount Zirkel Wilderness access points, developed fee camping and day use boating area
Fish Creek Reservoir	High use, municipal water supply for the city of Steamboat Springs
Walton Creek Falls	Spectacular falls, not readily accessible by the public because of private land
Dumont Lake	High rec use, accessible from Rabbit Ears Pass, winter and summer
Slack- Weiss Reservoir	Small, popular dispersed camping and fishing site
South Fork of Fish Creek Long Lake, Fish Creek Falls	Within 5 miles of Steamboat Springs, receives year round use, scenic, picnic and day use area
Muddy Pass Lake	Visible from Rabbit Ears Pass, Scenic, High periodic use.
South Fork of Silver Creek	Inside the Sarvis Creek Wilderness, one of two main trail segments, increasing use levels
Bear River	Outflow from Bear Lake, high use corridor
Bear Lake	Developed for fisheries, highest use area on Yampa District
Red Dirt Reservoir	No facilities yet, High use

Source: Routt N.F. Watershed Condition Assessment 1997

Wildlife-Related Recreation

Wildlife-related activities (hunting, fishing, viewing wildlife) are extremely important to forest visitors. In 1994 and 1995, nearly 45% of residents in the Rocky Mountain Region, age 15 and older, participated in some kind of activity involving wildlife (Cordell et al. 1997).

Hunting (all types) has increased by nearly 20% over the last 5 years, but is expected to level off by 2005. In 1994, hunting accounted for 15% of total RVDs (approximately 360,000 RVDs or 616,000 visitors).

Fishing is a traditional use of the Forest. There are nearly 1,990 miles of streams, 1,343 acres of natural lakes, and 1,121 acres of reservoirs. Fishing accounted for 10% of total RVDs in 1994 (approximately 268,600 RVDs or 715,000 visitors).

Nonconsumptive wildlife use is an activity that captures visitors' imaginations. Demand for viewing wildlife, nature study, and other forms of nonconsumptive wildlife recreation on the Forest is underestimated, according to national studies (Cordell et al. 1997). Wildlife viewing is difficult to estimate because most visitors want to see wildlife (80% believe that nonconsumptive wildlife opportunities are important in their selection of an outdoor recreation destination), but when asked, only 37% of the recreating public actually spent time viewing wildlife during 1994-1995.

Wilderness Recreation

For many people, recreation isn't the most important aspect of wilderness preservation. Many feel that protection of the resource, including water, air, species diversity, scenery, and open spaces in perpetuity are extremely important reasons to set aside wilderness (Cordell et al. 1997). Nonetheless, wilderness recreation is unique. There are few substitutes for a wilderness experience. The Wilderness Act gives a clear mandate that wilderness should play an important role in providing "outstanding opportunities for solitude or a primitive and un-confined type of recreation."

The act was passed to ensure benefits for the American public, however, heavy use in some main trail corridors are detracting from the experience. A person's reaction to actual numbers of people can be estimated according to prior experience levels and expectations. In areas where visitors are accustomed to high visitation, encounters can have a negligible effect on that experience. However, where users aren't prepared for high use, encounters can detract from the overall experience (Hammitt and Patterson 1993; Graefe et al. [no date]).

In 1994, wilderness use accounted for 87,000 RVDs. A wilderness needs assessment conducted by the Forest indicated the nature of wilderness use on the Forest has changed since 1987; unlike 10 years ago, more of today's visitors enter the wilderness for shorter periods of time. This puts additional pressure on that portion of the trail closest to the trailhead. The RVD measure equates a visitor day to 12 hours, however one RVD could mean more visitors for shorter durations. More visitors for shorter periods of time with increasing frequency of use indicates greater impacts on trails along the perimeter of the wilderness system, especially where trails parallel the boundary or where trailheads are easily accessed.

Winter Dispersed Recreation

Winter recreation is generally influenced by technology (specifically, improvements in winter gear that guarantee warmth in severe weather conditions) and demographics. Winter recreation is dominated by users between the ages of 25 and 54. Nearly 74% of users are in these age categories. Estimates indicate that in the 4 years since 1991,

snowmobiling has increased 10% and cross-country skiing has increased 9%. By 2010, estimates indicate that snowmobiling will have increased 39% over 1987 and cross-country skiing will have increased 106% (English, et. al., 1993).

Year round use of trails and trailheads is provided by plowing parking areas, grooming and signing trail systems, and providing winter trail maps and information at trailheads. The state sponsors local snowmobiles clubs in trail grooming operations with proceeds from registration fees. Partnerships with the state and local user groups help defray associated costs, however, program development and management is costly. Like other programs, the Forest is developing creative financing in order to provide quality opportunities.

Environmental Consequences

General Effects

In all alternatives, recreation use on the Forest will continue to increase, however supply will affect the amount of use in Alternative F by restricting movement through the Forest. The quantity, quality, and distribution of opportunities is planned for as a mix of ROS classes available (Figure 3-26) and the theme of each alternative. Funding varies according to alternative and is discussed further in Chapter 2.

Available quality recreation opportunities are dependent on access, resource condition, and the ability to disperse and manage use across the Forest. The ROS is a systematic approach to determining the range of opportunities based on access, setting, number of people (density) in one area, and the degree of management an area receives. A desired condition ROS class indicates the maximum levels of change an area should experience in terms of ROS criteria over the life of the Plan.

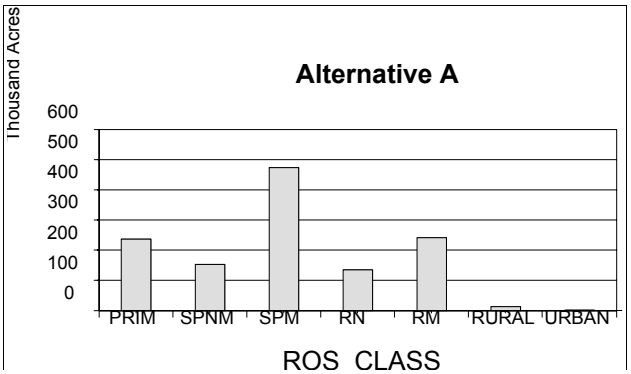
Figure 3-26 illustrates the mix of ROS classes for each alternative on both the Routt National Forest and on the Williams Fork portion of the Arapaho National Forest. Alternatives with a dominant ROS class include F with more semi-primitive nonmotorized (SPNM), and Alternatives E and G with more semi-primitive motorized (SPM).

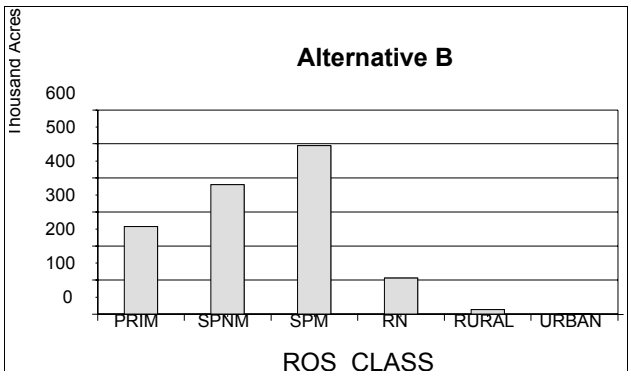
A change from 1983 is from a single wilderness setting to a spectrum within the wilderness. Management area allocations allow for the delineation between trail systems and areas that are less frequently used. Adding the semi-primitive nonmotorized dimension to the high-use trails better reflects the level of management needed to maintain the resource. There would be more semi-primitive nonmotorized in Alternative F, followed by Alternatives B, D, and C. Alternatives A, E, and G all provide semi-primitive nonmotorized in wilderness areas, but not so much outside the wilderness.

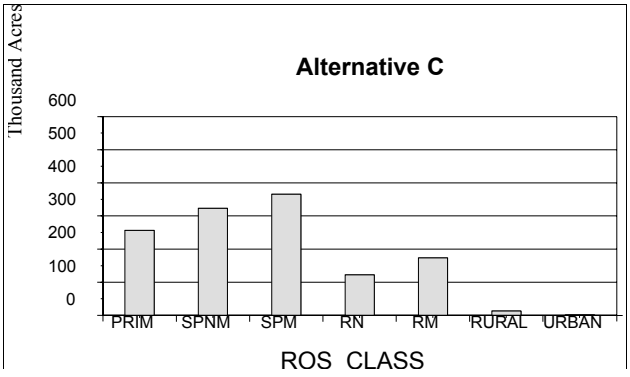
In addition, the otherwise urban setting in ski areas would be managed to meet a more rural setting. This is to accomplish the same level of management without additional development at the summit of the Ski Area. A visual quality objective of Modification is consistent with the Rural (R) and Urban (U) settings.

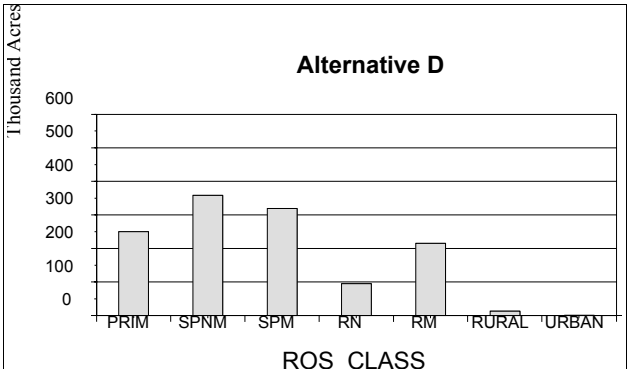
The proposed alternatives also utilize the roaded modified (RM) ROS class in Management Area Prescription 5.13. This ROS class replaces many of the old roaded natural (RN) areas in the backcountry. The roaded modified ROS class has been used in timber harvesting areas because of the concern over visuals and other recreation values that can't be met when harvesting trees is the primary objective. The roaded natural ROS is consistent with high development levels of roads with a range of recreation opportunities. Once a logged stand begins to grow back, it can take anywhere from 10-15 years before it can be re-classified as roaded natural.

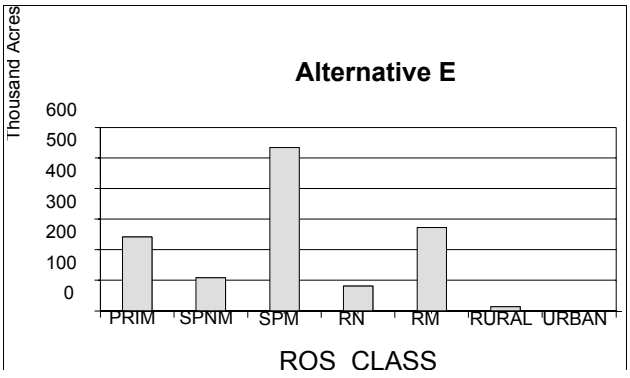
Figure 3-26. Proposed Mix of ROS Classes by Alternative

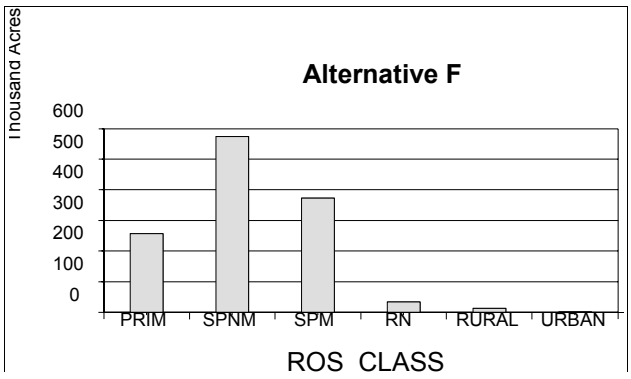




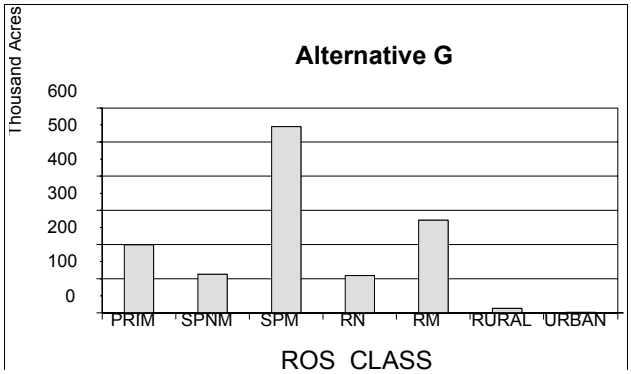








Source: GIS (ARC/Info), ROS and allocation layers



In addition, the semi-primitive motorized class has been used for trails and roads through the 5.13 prescription, providing a corridor of high recreation values in the area. The new allocations would provide a better emphasis of the semi-primitive motorized in Alternatives A, C, D, E, and G. Alternatives B and F have no roaded modified classes.

Direct and Indirect Effects

Developed Recreation - Budget levels will continue to affect the quality of services in developed facilities in all alternatives. New investments and rehabilitation projects that have been planned (and tentatively funded) will be completed in all alternatives, as budget levels allow. Improvements listed in the Forest transition plan will be a priority for facility development. Beyond the capitol investment program, any facility rehabilitation will be contingent on increased (full implementation) funding levels (see budget priorities in Chapter 2) and on the use of private partners to assist in developing and managing facilities.

Over time, a decrease in funds for managed facilities can be expected in all alternatives. More funding would be provided in Alternative G, followed by Alternatives D, E, C, B, A, and F. Use levels can be expected to be constant through all alternatives except F. Road obliteration priorities in Alternative F will limit user access (under full implementation).

Special-Uses Administration - Recreation special-uses, including any need for more or fewer outfitter and guide operations, would be most affected by the amount of area managed for wilderness and semi-primitive nonmotorized areas. Additional wilderness will increase the need for outfitted activities due to limitations on access. This need would occur year round. The greatest potential for additional outfitter and guide activities would be in Alternatives F, B, and D, followed by C, A, E, and G.

In addition, a concessionaire program will impact the current special-uses program with new and additional administrative requirements. The success of such a program depends on the current condition of the facilities, the amount of time required to administer the permit, and concessionaire qualifications. A larger share of the budget would be allocated to recreation special uses in Alternative B, followed by C, F, D, A, G, and E.

Dispersed Recreation - Dispersed recreation includes motorized and nonmotorized activities. Dispersed campers prefer the solitude along primitive roads. The ROS classes which best support this activity are semi-primitive motorized (Yuan 1989) and in some instances, roaded natural. On the Routt National Forest, there will be more roaded natural and semi-primitive motorized acres available in alternatives G, E, A, and B, followed by C, D, and F. In the Williams Fork area, semi-primitive motorized opportunities would be greatest in Alternative G, C, D, and A, followed by B, E, and F.

Open roads provide for additional opportunities to disperse use. Alternative F would have fewer acres and open roads available for recreation. The quality of the recreation experience will be degraded as use levels concentrate in limited areas. Users could be displaced, especially users from outside the area (greater than 50 miles away) who make the Routt National Forest a destination. In the long run, use levels could decrease in Alternative F.

There would be little difference in the effects of the other alternatives unless site-specific decisions are made to close historically used areas because of increasing resource concerns, either directly or indirectly related to recreation use. In all alternatives, sites

will continue to be monitored and mitigated according to standards and guidelines in the Forest Plan.

Trails and Trailheads - Trails provide fitness, challenge, and backcountry access opportunities. Trails also help provide a link to communities and other recreation resources on adjacent lands. According to the 1991 SCORP, the number one issue for the area around the Routt National Forest is recreational access to public lands. Access will be provided for in all alternatives, but opportunities to disperse once on the Forest will be limited in Alternative F.

Trail uses such as day hiking and mountain biking will continue to increase in the next two decades, with a shift from users less than 30 years old to those 40 years old and older. Mountain bikers prefer natural conditions in a semi-primitive nonmotorized setting (Hollenhorst, et at. 1995). As use increases, trail maintenance and management will become an important tool to disperse trail users in order to provide a satisfying experience (Gobster 1990) and to provide resource protection where it is most needed.

The quality of nonmotorized trail opportunities is dependent on scenery and the number of users at one time in a specific area. The mix of ROS classes helps identify a preferred setting and user density. Higher use levels would be expected on fewer numbers of trails in Alternative F. There would be more trail opportunities in Alternatives G, A, and E, with added effects given the amount of logging that could potentially occur forestwide. Alternatives B, C, and D would provide the highest quality settings and the same number of miles currently allowed on the Forest.

A quality motorized trail system is dependent on budget allocation, creative financing with partners, and other management activities. New road construction is anticipated in Alternatives G, E, and A, followed by D, C, B,? and F. Obliteration will be the same in all alternatives except F. In Alternative F, the miles of road obliteration is expected to double under full implementation budget levels.

Wilderness Recreation - Use-related impacts are generally most severe in high altitude areas where vegetation is most sensitive to trampling. Additions to the wilderness system, as outlined in Alternatives B and D, would potentially disperse wilderness use, thereby decreasing impacts along heavily used wilderness trail systems. Alternative F proposes to add 302,500 acres (23% of total Forest acres) to the wilderness system. Such an addition would create a need for additional funding for law enforcement and road and facility obliteration.

The air quality issues in Mount Zirkel Wilderness will eventually affect wilderness experiences because of the threat to the natural regime in the wilderness. In all alternatives, the air quality in Mount Zirkel Wilderness will be monitored.

Wildlife Recreation - Wildlife and fish-related recreation is dependent on adequate amounts and distribution of habitat. These activities would vary little among alternatives, but may be affected by travel management decisions and other land management activities. Wildlife recreation is not directly affected by differences in budget allocation.

Hunting season is one of the busiest seasons in the backcountry of the Forest. According to wildlife biologists, big game animals are most affected by open roads which impact habitat effectiveness. The more human interaction big game have, the more apt they are to flee the area. Once they leave the forest, hunter success rates decrease significantly, and big game populations continue to increase. In addition, excessive pre-

season use of an area can result in big game leaving the forest for the safety of private land.

The miles of road obliteration and closure proposed under full implementation budget levels in Alternative F would provide better opportunity for hunter success but would require more hunters to give up the aid of a motorized vehicle when accessing an area. By contrast, there would be more road construction and reconstruction in Alternatives G and E which could actually decrease hunter satisfaction. Road obliteration and construction levels in Alternatives A, B, C, and D would have a negligible effect on hunter success.

Fishing is affected by water quality and fish habitat management. Greater amounts of fisheries management activities (monitoring and stream surveys) would occur in alternatives F and B. There would be little difference in projects and management in Alternatives C and D, followed by Alternatives A, E, and G.

The need for wildlife viewing opportunities has been identified in both the 1991 SCORP and the Forest Service RPA assessment. Opportunities depend on accessible, nearby natural environments. Opportunities would be greatest in Alternatives F, D, B, C, and A. Opportunities will initially increase in Alternatives G and E, then decrease over time. Management activities may benefit nonconsumptive wildlife use through wildlife habitat enhancement projects, such as burning, the development of habitat structures, and snag treatment. Wildlife enhancement activities vary little among alternatives, with the exception of the project-related activities in each alternative. There would be more project work in Alternative A, followed by E, G, C, D, B, and F.

Winter Recreation - Winter use is primarily dispersed, but user access points and trailheads are points of congestion. User conflict generally arises between groups because of limitations on access and preferences for experiences. Managers attempt to separate users with a marked trail system. Neither motorized nor nonmotorized use occurs very far from trails.

There is only one area on the Forest with what could be considered high winter use - Rabbit Ears Pass. The Pass has been separated between motorized and nonmotorized suggested use zones as a result of years of discussions between users and management. Management will continue to emphasize this mutually agreed-upon boundary in all alternatives.

Use would be most limited in Alternative F, as shown in Table 3-59. Motorized use will be prohibited, in accordance with standards and guidelines in specially designated areas, including wilderness, Research Natural Areas (RNAs), deer and elk winter range, developed ski areas, and wild river corridors in all alternatives.

Table 3-59. Winter Motorized Acreages by Alternative Calculated According to Management Area Prescriptions

Alternatives	Routt Acres	Williams Fork Acres	Total Acres	Percent Motorized*
A	1,001,400	100,900	1,102,300	81
B	879,900	67,800	947,700	70
C	987,900	101,000	1,088,900	80
D	963,500	78,200	1,041,700	77
E	978,000	78,200	1,056,200	78
F	270,800	21,900	292,700	22
G	975,400	78,200	1,053,600	78

*Percent of total acres of National Forest System lands (1,358,600 acres) - does not include private lands inside the Forest boundary.

Source: Total acres minus those allocated to 1.11, 1.12, 1.13, 1.2, 1.41, 1.5, 2.2, 3.21, 3.55, 5.41, 8.22, GIS (ARC/Info) Allocation layers

Effects from Travel Management - Travel management is one of the most controversial topics in forest management. The Forest uses travel management to help disperse use throughout the Forest. Dispersed recreation opportunities are directly related to road development and maintenance. To assist visitors in finding their destination, travel managers provide directional signing and other information along travelways. As destinations become easier to locate, traffic volumes actually decrease. Congestion along roads becomes less severe, and visitors are able to enjoy themselves more because they haven't had to fight traffic.

Road miles to be obliterated in Alternative F under full implementation would reduce quality dispersed recreation opportunities from their current level by concentrating users on fewer miles of roads. This would ultimately restrict access to fewer users. All other alternatives prescribe 50% fewer miles of road obliteration than Alternative F. Most of the prescribed road obliteration in the other alternatives would occur in conjunction with specific projects.

Road development in roadless areas has the potential to bring more visitors into the interior of the Forest where use has been previously limited. Remoteness would decrease with active management in Alternative G, followed by E, A, C, D, B, and F.

Effects from Range Management - Issues related to recreation from grazing include: stream and lake contamination, trampled streambanks and trails, manure on trails and in campsites, odors, livestock in developed facilities, and conflicts between livestock and recreationists. An example is when gates are left open by recreationists allowing livestock to wander or when campsites are suddenly invaded by a herd of sheep or cattle. Effects from range management are both direct and indirect, depending on the activity level in the allotment. Recreation would be comparably affected by range management in all alternatives except F where grazing activities would be reduced by 30%.

Effects from Research Natural Area - The differences in Research Natural Area (RNA) designation would affect recreation if research objectives differ from current recreation objectives and if recreation was restricted by the designation. As proposed, all RNAs would be compatible with current use patterns, unless use levels are restricted because of impacts to an area. RNA designation would exclude mountain bike use and any current and future motorized trail development in those areas. Alternative F has the largest amount of proposed RNAs (71,600 acres). Alternatives B, D, and E each have 70,100 acre; followed by Alternative G with 47,700 acres, Alternative C with 31,400 acres, and Alternative A with 600 acres.

Proposed RNAs inside the Wilderness Preservation System would have little affect on recreation due to current limitations on use in wilderness. In addition, the proposed RNAs are in areas with very little use. In all alternatives, most of the RNAs (as proposed) would be inside wilderness, with the exception of Alternative A (100% outside), Alternatives E and G (38% outside), and Alternative D (17% outside). Fewer than 10% of the RNAs proposed in Alternatives B, C, and F are outside wilderness.

Effects from Roadless Area Management - Inventoried roadless areas provide additional nonmotorized backcountry opportunities in a relatively unmodified setting. The

roadless condition of the area creates the feeling of solitude and, in some instances, provides an experience similar to wilderness recreation, with additional opportunities for activities not allowed in wilderness.

Current use patterns would neither change nor be affected by reallocation of roadless acreages to a nonmotorized management area prescription. Alternatives with unroaded areas allocated to wilderness include Alternatives F, B, and D. Alternative C allocates more unroaded acres to a backcountry nonmotorized management area than Alternatives A, E, or G.

Effects from Timber Management - Timber management has the potential to affect recreation experiences and opportunities in several ways; noise levels, log trucks sharing roads with sedans, changes to the landscape from clearcutting and slash piles, and additional roads. Affects are short and long term. According to the amount of acres in the timber base, Alternatives E, A, and G would emphasize logging, followed by Alternatives D, C, B, and F.

Initially, logging operations are a short-term activity which disrupts the normal level of activity in an area. If, on the other hand, logging is occurring where visitor use is high, visitors may be displaced because of log hauling along roads and the noise from chainsaws. Winter operations would not affect recreation outside managed corridors, but logging inside managed corridors will disrupt recreation during the life of the project. Visitors may be permanently displaced the longer a project lasts.

An altered landscape (very noticeable changes from within) can include anything from a clearcut to a road and is considered to be a long-term effect, creating a change from a semi-primitive to a roaded modified or roaded natural setting. The visual effect will not change until stands have regenerated to a 20-foot height or higher. Selective cutting, on the other hand, can have less of an effect on recreationists. A forested stand would? still be the characteristic landscape, and leftover slash would provide firewood. Logging would most affect recreation in a semi-primitive ROS setting in Alternatives E, G, and A; followed by D and C. There would be no intensive logging in Alternatives B and F.

There are recreational benefits from logging. In many cases, roads are built for a timber sale and then used by recreationists. Once the logging operation has been completed, travel along the road may be restricted. This has resulted in a misunderstanding with the general public over the purpose of the roads. Roads are typically closed once a sale has been complete, but depending on the objective, they might be obliterated.

The concern for recreationists is that they become accustomed to some roads that have been open for a number of years, providing them with additional dispersed opportunities, and then "seemingly with no warning, their new favorite spot is closed off" to them. New road construction and road reconstruction would be highest in Alternatives G, E, A, D, C, B, and F. The miles of road to be obliterated varies little among alternatives, with the exception of Alternative F which proposes to obliterate nearly twice the amount of the other alternatives under full implementation budget levels.

Cumulative Effects

In addition to the Forest Service, other recreation providers in the northwestern corner of Colorado include:

- Rocky Mountain National Monument and Dinosaur National Park, both within one-half day's drive of the Forest and both are accessible by way of US Highway 40 which traverses the Forest.

- Three other National Forests; the Arapaho/Roosevelt, the White River, and the Pike/San Isabel provide high quality trails and developed opportunities like high quality ski areas within a short drive of Denver and the surrounding metropolitan area.
- Three BLM sites and open spaces provide opportunities for four-wheeling, hunting, fishing, boating, canoeing, camping, hiking, bicycling, and viewing wildlife.
- Three Colorado State Parks, Pearl Lake, Stagecoach Reservoir, and Steamboat Lake provide camping, lake recreation, day-use, and open space.

Access into all of these areas include walk-in, four-wheel, roaded open country, and rural or state highways. The BLM provides open space, and very few restrictions. Potential increases in use of these areas may reduce increasing demand for additional off-highway vehicle trails on the Forest.

Over time and with more tourism growth, there will be added pressure on the Forest to increase the amount of opportunities on the developed end of the ROS, specifically facility development and more roads and trails into unroaded areas. The resultant change to the natural landscape would increase opportunities associated with road development and decrease opportunities for visitors seeking a primitive environment. The degree of change would vary by alternative and be cumulative over time.

The greatest shift toward the developed end of the ROS would be in Alternatives A, E, and G. These alternatives would accelerate the rate of growth into the interior forest through the development of roads, with a resultant loss of other values such as solitude and wildlife-related recreation opportunities. Alternative B would eventually add to the facility and trail systems. This alternative has the most potential to eliminate the backlog of maintenance while providing new opportunities.

Alternatives C and D emphasize semi-primitive recreation opportunities. This emphasis provides today's users with reasonable assurance of future backcountry opportunities and development possibilities. Alternative F would preserve unroaded areas and attempt to reverse previous development more than any other alternative. Visitors would be restricted to trail and road corridors, creating some congestion with increased use levels in fewer areas. Recreation provision is not a primary use of the Forest in Alternative F. However, the combination of increased users and normal frequency of use in a more concentrated setting would potentially impact all resources along major travelways.

Research Natural Areas

Introduction

Research Natural Areas (RNAs) are selected to provide a spectrum of relatively undisturbed areas representing a wide range of natural variability within important natural ecosystems and environments (for example; forest, shrubland, grassland, alpine, aquatic, and geological environments) and areas with special or unique characteristics of scientific importance. RNAs are also selected to:

- Serve as reference areas for evaluating the range of natural variability and the impacts of management in similar environments.

- Maintain representative and key elements of biological diversity at the genetic, species, population, community, and/or landscape levels.
- Serve as areas for the study of ecosystems and ecological processes including succession.
- Provide on-site and extension educational activities.
- Serve as baseline areas for measuring ecological change.

Five areas, totalling 70,100 acres, are proposed as RNAs in alternatives B, D, E, and G. One RNA, totalling 600 acres, is proposed in Alternative A. Alternative F proposes six RNAs, totalling 71,600 acres. Alternative C proposes 3 RNAs, totalling 31,400 acres. Environments in the Gore, Rabbit Ears, Park, Elkhead, Never Summer, and Williams Fork Mountains are represented. Additional information on RNAs is provided in Appendix F.

There are many designations that attempt to maintain natural ecosystem components and processes. In addition to RNAs, the Forest Service designates botanical, ecological, geological, zoological, and scenic special areas. There are also national recreation areas, wilderness areas, and wild and scenic rivers. There are similar designations for both private and state lands and in countries all over the world. Although the designations differ in their degree of disturbance, isolation, and management emphasis, they all contribute to the protection of biological diversity across the landscape.

The Forest interdisciplinary team reviewed the agency direction for RNA designation. Areas with extensive, relatively undisturbed plant communities were identified. Areas were screened to find suitable sites in vacant grazing allotments, roadless areas, and unsuitable timber areas. The objective was to find RNA candidates while minimizing potential conflicts with existing land allocations. In the areas selected as potential RNAs, current human uses were compatible with RNA designation.

During the summer of 1994, the Forest contracted with the Colorado Natural Areas Program (CNAP), a part of Colorado state government, to inventory potential RNA candidates. The CNAP provided reports of each potential RNA, including detailed descriptions, distinguishing features, and acreage by vegetation cover types. Some of this information is summarized in Appendix F.

Legal and Administrative Framework

Code of Federal Regulation (CFR 219.25) states that forest planning shall provide for the establishment of Research Natural Areas. Planning shall make provision for the identification of examples of important forest, shrubland, grassland, alpine, aquatic, and geologic types that have special or unique characteristics of scientific interest and importance and that are needed to complete the national network of RNAs.

On July 19, 1993, the Chief of the Forest Service issued a national strategy for recognizing the expanding role of RNAs in ecosystem management. An important part of this strategy was to delegate authority to the Regional Forester to designate Research Natural Areas. On November 1, 1993, the Rocky Mountain Regional Forester and the Director of the Rocky Mountain Forest and Range Experiment Station called on forests in the region to expand the RNA system. The Forests were asked to make a concerted effort to identify areas as potential RNAs in their forest plan revisions.

Key Indicators

- Acres of potential RNAs.
- Location of individual RNAs.
- Trade-offs in outputs from timber, grazing, recreation, minerals, and accessibility that would result if potential RNAs were designated.

Affected Environment

California Park (600 acres) was proposed for RNA designation in the 1983 Plan. No establishment record or designation was completed for this area. It was determined that the area did not have the characteristics necessary for RNA consideration.

The Kettle Lakes area (6,800 acres) was nominated as an RNA, and an establishment record written in 1992. However, the area has not yet been designated as an RNA. This proposed RNA is found in all alternatives except Alternative A.

Black Mountain (1,500 acres) was only proposed for RNA designation under Alternative F.

Five additional areas, totalling 70,100 acres, will be analyzed for possible RNA designation. Environments in the Gore, Rabbit Ears, Park, Elkhead, Never Summer, and Williams Fork Mountains are represented. Additional information on all proposed RNAs is provided in Appendix F.

Environmental Consequences

General Effects

Alternative A has one proposed RNA of 600 acres in California Park. It was proposed in the 1983 Plan. This area is not proposed in any other alternative, since it was determined not to have the characteristics necessary for RNA consideration. Five potential RNAs have been identified in alternatives B, D, E, F, and G. Alternative F also displays an additional 1,500 acres (the Black Mountain RNA) for designation.

Alternative C proposes 3 areas for designation: Kettle Lakes, Mad Creek, and Silver Creek. The Kettle Lakes RNA was reduced in size to 6,400 acres because of an existing motorized trail. Only the wilderness portion of the Mad Creek RNA was considered for designation, reducing the size to 12,600 acres. The Silver Creek RNA is 12,400 acres in all the alternatives. Table 3-60 summarizes the proposed RNAs.

Table 3-60. Proposed RNAs by Alternative (acres rounded to hundreds)

Area	Mountain Range	Vegetation Zone 1/	Alt A Acres	Alt B Acres	Alt C Acres	Alt D Acres	Alt E Acres	Alt F Acres	Alt G Acres
Kettle Lakes	Park Range	subalpine, montane	0	6,800	6,400	6,800	6,800	6,800	6,800

Mad Creek	Park Range	alpine, subalpine, montane, foothills	0	19,200	12,600	19,200	19,200	19,200	19,200
Silver Creek	Gore Range	subalpine, montane	0	12,400	12,400	12,400	12,400	12,400	12,400
Never Summer	Never Summer Range	alpine, subalpine, montane	0	9,300	0	9,300	9,300	9,300	9,300
Williams Fork	Williams Fork Range	alpine, subalpine	0	22,400	0	22,400	22,400	22,400	22,400
Black Mountain	Elkhead Range	montane	0	0	0	0	0	1,500	0
California Park	Elkhead Range	montane, foothills	600	0	0	0	0	0	0
Total Acres			600	70,100	31,400	70,100	70,100	71,600	70,100

1/ Zones are generalizations for the Forest as follows:
Foothills zone - < 8,000 feet
Mountain zone - 8,000 feet to 10,000 feet
Sub alpine zone - 10,000 feet to 11,200 feet
Alpine zone - >11,200 feet

Source: GIS (ARC/Info), allocation layers

When possible, the boundaries of each proposed RNA were aligned with watershed boundaries. Areas were reviewed to determine if grazing allotments were active or vacant. Vacant allotments were favored for consideration of RNA designation to lessen the impacts on the Forest grazing program. The size of each proposed RNA was designed to maintain ecosystem processes and landscape-scale natural disturbance patterns, when feasible. The local impacts of recreation are much less significant in large areas because they have a smaller overall effect on ecosystem composition, structure, and processes. Figure 3-27 displays the location of the seven proposed RNAs.

RNAs are managed to maintain natural (relatively pristine/presettlement) conditions by allowing ecological processes to prevail with minimal human intervention. However, under some circumstances, deliberate manipulation may be utilized to maintain the ecosystem or unique features for which the RNA was established or to re-establish natural ecological processes. Vegetation, habitat, soil productivity, water quality, and ecological processes will be in a natural condition or in as close a natural condition as practicable. Heritage resources are protected by RNA designation since ground-disturbing activities are limited.

A variety of uses are allowed in RNAs as long as the activity or use does not become a threat to the values for which the RNA was proposed.

Direct and Indirect Effects

Other environmental consequences sections display effects in terms of planned activities and their associated effects to that particular resource. Because no activities are allowed that could compromise the values for which RNA's are established, this kind of analysis has little value. To better display trade-offs and effects of RNA establishment, this section will display effects to planned activities from potential Research Natural Area allocation.

Effects of Proposed RNAs on Cultural Resource Management - There are no known archaeological or other cultural resources in any of the proposed RNAs.

However, any of these resources that might be located in the future would be given additional protection through RNA designation.

Effects of Proposed RNAs on Facilities Management - Buildings and developed recreation sites are prohibited, unless there are exceptional circumstances which do not threaten the values for which the RNA was proposed. There are no known eligible or listed heritage resources or other buildings or structures within any of the proposed RNAs.

Effects of Proposed RNAs on Fire Management - Prescribed natural fires will be allowed to burn, except where there is substantial threat to human life or property outside the RNA boundary or where fire threatens values for which the RNA was proposed. Human-caused fires will be controlled, where possible. Where excessive fuel build up from past fire suppression threatens the RNA, fires will be controlled.

The use of scheduled prescribed fire may be permitted to restore a natural fire regime or to reduce unnatural fuel loads. Fire control techniques will minimize ground disturbance. Natural barriers will be used to confine or contain fire where possible.

There are no known immediate needs for scheduled prescribed fires in the seven proposed RNAs.

Effects of Proposed RNAs on Fish and Wildlife Management - Habitat manipulation for wildlife is prohibited unless it is specifically needed to restore natural ecosystem conditions. Habitat manipulation is allowed if specifically designed for the protection of threatened, endangered, or sensitive species. There are no known habitat manipulation projects needed in the proposed RNAs at this time.

Exotic (nonnative) animal species will be controlled when feasible and biological and socially desirable. The control method selected will minimize threats to native species. Presently, there are no known exotic species needing control in any of the proposed RNAs.

Effects of Proposed RNAs on Insect and Disease Management - Natural outbreaks of native insects and disease are allowed to proceed without intervention, unless they are a substantial threat to important resources inside or outside the RNA boundary. Control methods will minimize disturbance. There are no known insect or disease problems in any of the RNAs at this time.

Effects of Proposed RNAs on Minerals Extraction - There has been little minerals activity in any of the proposed RNAs. The Henderson and Bobtail mines were located just to the north of the proposed Williams Fork RNA, indicating some potential for minerals.

Ten patented mining claims are located on private land near the western boundary of the Never Summer proposed RNA. An additional nine unpatented mining claims are located in the southern portion of the proposed RNA. The Williams Fork potential RNA contains two patented mining claims near the boundary. If the Never Summer or Williams Fork area is designated as an RNA, the boundaries would be adjusted to exclude the patented claims.

All RNAs will be proposed for withdrawal from locatable mineral entry, contingent on application and approval by the Secretary of the Interior. Designated wilderness is withdrawn from locatable mineral entry as part of wilderness legislation (see Table 3-63 for RNA acres within designated wilderness). The effect of withdrawal would be lost

opportunities on the unpatented mining claims within the Never Summer proposed RNA, should it be designated.

Oil and gas leasing is unavailable in the proposed RNAs. This causes a reduction in acres available for oil and gas leasing for all alternatives except Alternative A. However, the impact on oil and gas leasing is minimal since most proposed RNAs are within areas that have been identified as having no or low potential for oil and gas development. The two exceptions to this are California Park and Black Mountain, but the Alternatives with these proposed RNAs are managed differently for oil and gas leasing. See the Minerals section of this Chapter for more information.

Extraction of salable minerals (sand, gravel, hard rock for crushing, and landscape materials) would not be allowed in RNAs. There is no anticipated need for more salable mineral sources over the next 10-year period from potential RNAs on the Forest. Thus, the proposed RNAs do not affect the salable minerals program.

Effects of Proposed RNAs on Range Management - There are active grazing allotments within the proposed Kettle Lakes, Black Mountain, and California Park RNAs. All other RNAs are in vacant grazing allotments (these are not formally closed, but have been inactive for some time with no current grazing permits). The RNA portions of all allotments (vacant or active) within proposed RNA boundaries would be closed to any further grazing in the future. Table 3- 61 lists the capable rangeland acres that would no longer be available for grazing within the various RNAs.

The portion of the active grazing allotment occupied by the proposed Kettle Lakes RNA is marginally suitable for grazing and receives only rare use by cattle. Closure of this portion of the allotment would not require any change in permitted livestock. All other RNA's are in vacant grazing allotments with no current grazing permits. Thus, there would be little effect to forestwide grazing levels in Alternatives B, C, D, E, and G. The California Park proposed RNA is actively grazed, and the effect of RNA designation would be the loss of AUMs on the 588 capable acres in Alternative A. The Black Mountain RNA is actively grazed, and designation of this area as an RNA would result in the loss of AUMs on the 1480 capable acres under Alternative F.

Exotic (nonnative) plant species will be controlled where feasible and biological and socially desirable. The control method selected will minimize threats to native species.

Table 3-61. Summary of Capable Rangeland Acres by RNA by Alternative

Area	Total Acres in Data Base	Alt A Acres	Alt B Acres	Alt C Acres	Alt D Acres	Alt E Acres	Alt F Acres	Alt G Acres
Kettle Lakes Alt C	6,442							
-cattle and sheep				6,104				
-sheep only				161				
Kettle Lakes All other	6,842							
-cattle and sheep			6,500		6,500	6,500	6,500	6,500
-sheep only			166		166	166	166	166
Mad Creek Alt C	12,806							
-cattle and sheep				8,398				
-sheep only				2,616				
Mad Creek All other	19,423							
-cattle and sheep			13,124		13,124	13,124	13,124	13,124
-sheep only			3,187		3,187	3,187	3,187	3,187
Silver Creek	12,375							

-cattle and sheep -sheep only			11,756 592	11,756 592	11,756 592	11,756 592	11,756 592	11,756 592
Never Summer -cattle and sheep -sheep only	9,280		 5,212 2,104		 5,212 2,104	 5,212 2,104	 5,212 2,104	 5,212 2,104
Williams Fork -cattle and sheep -sheep only	22,350		 8,072 6,842		 8,072 6,842	 8,072 6,842	 8,072 6,842	 8,072 6,842
Black Mountain -cattle and sheep -sheep only	1,498						 1,459 21	
California Park -cattle and sheep -sheep only	588	 582 6						

Source: Acre figures are from Paradox table RANGE, derived from GIS (DWRIS) multi-overlay. See the Range Suitability AnalysisSpecialist Report for a description of how these acres were derived.

Effects of Proposed RNAs on Recreation Management - The Forest Service will not actively advertise RNAs as destinations for recreation use. However, existing nonvehicular recreation use will be allowed as long as the use does not become a threat to the values for which the RNA was proposed. Current levels of horseback riding, hunting, fishing, camping, and related low impact uses by the public will be allowed to continue. If resource degradation develops from increased use, the public will be encouraged to shift use to other, less impacted areas. The monitoring and assessments for recreation use in the wilderness would also apply to RNAs.

Trails which exist prior to RNA designation are allowed for recreation, scientific, or educational access, except when they are a threat to the values for which the RNA was proposed. The construction of new trails is prohibited except when necessary to correct resource damage occurring from existing trails. On the proposed Williams Fork RNA, unmaintained trails that are used for recreation in the Middle Fork and the Short Creek drainages may be upgraded to maintained trails in the future to mitigate potential erosion.

Mountain bikes are generally not allowed within RNAs, except when they provide necessary access for scientific or educational purposes. An exception to this standard is proposed in order to continue to allow the established use on maintained trails in the proposed Williams Fork RNA. There is no mountain bike use in the proposed RNAs that occur within wilderness areas because of wilderness regulations. The other proposed RNAs do not have trails that are suitable or used for mountain biking. No change in the trail system is anticipated for the remainder of the proposed RNAs.

Based in part on public comments received concerning the non-wilderness portion of the proposed Mad Creek RNA and its recreational use, the non-wilderness portion was removed from RNA consideration in Alternative C.

The Kettle Lakes RNA was reduced in size by 400 acres in Alternative C to reduce impacts and potential conflicts with the motorized Grizzley-Helena trail.

Motorized use is not allowed in RNAs, unless necessary for research or educational access.

Effects of Proposed RNAs on Travel Management - New road construction in RNAs is prohibited. Existing roads are restricted from motorized use or obliterated except when needed for necessary scientific, educational, or administrative purposes. Volunteer two-track roads within proposed RNAs would be obliterated.

The addition of seven RNAs will have no significant effect on the number of developed roads on the Forest.

Effects of Proposed RNAs on Special-Use Management - Proposals for nonmanipulative research will require approval of the Rocky Mountain Forest and Range Experiment Station Director and the applicable District Ranger.

Special-use permits can be issued when they do not conflict with the values for which the RNA was proposed. The need for special-use permits will be evaluated on a case-by-case basis.

Effects of Proposed RNAs on Threatened, Endangered, and Sensitive Species Management - Populations of federally listed threatened and endangered species located within any of the proposed RNAs will be protected according to stipulations under the Endangered Species Act and applicable forest-wide standards and guidelines. Sensitive species located within any of the proposed RNAs will be protected by applicable forest-wide standards and guidelines. The overall effect of RNA designation would provide additional protection for these species.

Effects of Proposed RNAs on Timber Management - The proposed RNAs are not available for timber harvest. Table 3-62 lists the approximate amount of tentatively suitable acres in each of the proposed RNAs. Although these lands are tentatively suitable, they would be available for timber harvest only if allocated to management area prescriptions 5.11 or 5.13.

Alternatives B, D, E, F, and G have 13,595 acres of tentatively suitable lands that would not be available for timber harvest if the proposed RNAs are designated. Alternative C has 1,650 acres, while Alternative A has 570 acres.

Table 3-62. Summary of Tentatively Suitable Timber Acres by RNA

Proposed Research Natural Area	Total Acres Tentatively Suitable	Acres Conifer	Acres Aspen
Kettle Lakes - Alt C	1,650	1,550	100
Kettle Lakes - All other Alternatives	1,876	1,738	138
Mad Creek - Alt C	0	0	0
Mad Creek - All other Alternatives	1,067	*945	122
Silver Creek	0	0	0
Never Summer	6,128	**6,087	41
Williams Fork	4,524	***4,524	0
California Park	570	570	0
Black Mountain	0	0	0

***All 945 acres of conifer are on >40% slopes. **3,349 acres of conifer are on >40% slopes. ***4,464 acres of conifer are on >40% slopes**

Source: GIS (DWRIS), overlay of TSUIT and RNA layers

Effects of Proposed RNAs on Wilderness Management - Table 3-63 shows the acres of RNAs within wilderness and the acres outside wilderness by alternative. Alternative F allocates the most RNA acreage (70,400) within designated or proposed wilderness.

Alternatives C, E, and G allocate a common amount within wilderness acres (29,400) to proposed RNAs. Alternative B allocates the second highest amount of acres within wilderness (46,200), while Alternative D allocates 39, 500 acres. Alternative A does not allocate any RNA within wilderness areas.

Table 3-63. RNA Acres by Alternative Within Existing or Proposed Wilderness and Outside Wilderness (acres rounded to the nearest hundred)

Proposed RNA	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Within Wilderness							
Kettle Lakes	0	6,500	4,400	6,400	4,400	6,800	4,400
Mad Creek	0	19,200	12,600	12,600	12,600	19,200	12,600
Silver Creek	0	12,400	12,400	12,400	12,400	12,400	12,400
Never Summer	0	8,100	0	8,100	0	8,100	0
Williams Fork	0	0	0	0	0	22,400	0
Black Mountain	0	0	0	0	0	1,500	0
California Park	0	0	0	0	0	0	0
Total Within Wilderness	0	46,200	29,400	39,500	29,400	70,400	29,400
Outside Wilderness							
Kettle Lakes	0	300	2,000	400	2,400	0	2,400
Mad Creek	0	0	0	6,600	6,600	0	6,600
Silver Creek	0	0	0	0	0	0	0
Never Summer	0	1,200	0	1,200	9,300	1,200	9,300
Williams Fork	0	22,400	0	22,400	22,400	0	22,400
Black Mountain	0	0	0	0	0	0	0
California Park	600	0	0	0	0	0	0
Total Outside Wilderness	600	23,900	2,000	30,600	40,700	1,200	40,700
GRAND TOTAL	600	70,100	31,400	70,100	70,100	71,600	70,100

Source: GIS (ARC/Info), allocation layers

Cumulative Effects

Cumulative effects resulting from designation of Research Natural Areas would include present and future loss of commodity production (principally wood products and grazing products). Recreational pursuits in the future could be affected by some of the limitations prescribed by RNA direction on types of recreation allowed and limits on accessibility. Designation of RNAs will add to the acreage on the Forest where ecological processes are largely unaffected by human influences. This could affect biological diversity on the Forest by providing a larger area allocated to prescriptions where ecological processes are largely unaffected by human influences.

Roadless Areas

Introduction

There are 32 inventoried roadless areas totalling 502,245 acres identified on the Forest. Figure 3-28 displays the location of each inventoried roadless area on the Forest.

The Forest Service is required to inventory, evaluate and consider all roadless areas for possible inclusion in the National Wilderness Preservation System. 36 CFR 219.17 states:

"Unless otherwise provided by law, roadless areas within the National Forest System shall be evaluated and considered for recommendation as potential wilderness areas during the forest planning process..."

The Revised Plan process inventoried, identified, and will make recommendations on how to manage roadless areas. Areas qualify to be studied if:

1. They contain 5,000 acres or more.
2. They contain less than 5,000 acres, but they are:
    - Manageable in their natural condition
    - Self-contained ecosystems, such as an island.
    - Adjacent to existing wilderness or primitive areas, regardless of their size.
3. They do not contain improved roads maintained for travel (roads that are not numbered roads on the system and are not regularly maintained).

Inventoried roadless areas may contain improvements such as motorized trails, fences, outfitter camps, and historical logging activities. Roadless areas on the Routt National Forest were mapped using the criteria listed above (FSM 1909.12). If an area meets the above criteria, it will be studied to determine if it is eligible for potential wilderness designation.

Legal and Administrative Framework

- The Wilderness Act of 1964.
- Code of Federal Regulations (CFR) 36 at 219 Planning.
- Forest Service Manual 1900.
- Forest Service Handbook 1909.12

Key Indicators

- Number of acres designated as capable and available for wilderness.
- Number of acres recommended for wilderness designation.
- Number of capable and available acres in allocations allowing activities which generally retain wilderness characteristics.

Affected Environment

Each of the 32 inventoried roadless areas was evaluated to determine its suitability as potential wilderness. As specified in FSH 1909.12, each area was evaluated on its capability for wilderness designation. Those areas found to be capable were then evaluated on their availability for wilderness designation. Areas found to be both capable and available were next analyzed based on the need for additional wilderness.

An area is recommended as suitable for wilderness designation if it meets the tests of capability, availability, and need:

- **Capability** of a potential wilderness is the degree to which the area contains characteristics relating to the environment (opportunity for solitude, opportunity for adventure), outdoor recreation opportunities, special features, and ability to be managed as wilderness.
- **Availability** is determined by the value of and need for the wilderness resource compared to the value of and need for other resources.
- **Need** is determined through the public involvement process and the need for additional wilderness in the general area under consideration.

Based on the capability rating for the Forest, 340,990 acres in 15 roadless areas were found capable for wilderness. Each of these areas was also found to be available. Table 3-64 displays the roadless areas and those which were rated as capable and available. Appendix C describes each roadless area and the factors considered for capability, availability, and need. Based on the wilderness needs assessment, there is no need for additional wilderness on the Routt National Forest at this time.

Table 3-64. Roadless Area by Capability/Availability

Area Number	Area Name	Acreage	Capability	Availability
R21101	Black Mountain	22,750	Capable	Available
R21102	Sugarloaf Mountain	15,094	Capable	Available
R21104	Nipple Peak South	13,843	Capable	Available
R21111	Mad Creek	25,149	Capable	Available
R21113	Whalen Creek	1,090	Capable	Available
R21115	Kettle Lakes	11,303	Capable	Available
R21116	Long Park	43,979	Capable	Available
R21125	Bunker Basin	12,814	Capable	Available
R21126	Pagoda Peak	57,789	Capable	Available
R21127	Troublesome North	32,836	Capable	Available
R21128	Troublesome South	47,018	Capable	Available
R21129	Never Summer South	7,633	Capable	Available
R21130	Never Summer North	3,672	Capable	Available
R21132	Byers Peak	10,070	Capable	Available
R21133	Williams Fork	35,954	Capable	Available
R21103	Sugarloaf South	23,348	Not capable	Unavailable
R21105	Nipple Peak North	6,307	Not capable	Unavailable
R21106	Shield Mountain	10,156	Not capable	Unavailable
R21107	Elkhorn	11,048	Not capable	Unavailable
R21108	Dome Peak	36,760	Not capable	Unavailable
R21109	South Fork	4,727	Not capable	Unavailable
R21110	Gold Creek	3,137	Not capable	Unavailable
R21112	Chedsey Creek	963	Not capable	Unavailable
R21114	Grizzly Helena	6,376	Not capable	Unavailable
R21117	Walton Peak	5,339	Not capable	Unavailable
R21118	Little Green Creek	844	Not capable	Unavailable
R21119	Morrison Creek	8,456	Not capable	Unavailable
R21120	Barber Basin	5,468	Not capable	Unavailable

R21121	Bushy Creek	11,386	Not capable	Unavailable
R21123	Dome*	2,133	Not capable	Unavailable
R21124	Chatfield	11,273	Not capable	Unavailable
R21131	Copper Mountain	13,534	Not capable	Unavailable
* Area R21122 did not qualify for inclusion in the final inventory.				

Source: GIS (ARC/Info), roadless inventory layer

Environmental Consequences

General Effects

Different combinations of roadless areas are identified as recommended for wilderness designation in the alternatives. Areas were recommended for wilderness based on their capability and availability ratings and whether they were adjacent to existing wilderness. The following are recommendations for wilderness additions by alternative:

Alternatives A, C, E, and G have no additional areas recommended for wilderness designation.

Alternative B - Never Summer North, Never Summer South, Kettle Lakes, Whalen Creek, Mad Creek, Byers Peak, Bunker Basin, and Pagoda Peak (a total of 130,600 acres) are recommended for wilderness designation. All of these roadless areas, with the exception of Pagoda Peak, are adjacent to existing wilderness and would be additions if designated as wilderness. Pagoda Peak is the only roadless area that would become a new wilderness area.

Alternative D - Never Summer North, Never Summer South, Kettle Lakes, and Whalen Creek (a total of 24,300 acres) are recommended for designation. These areas are adjacent to existing wilderness and would become additions if designated as wilderness.

Alternative F - Black Mountain, Mad Creek, Whalen Creek, Kettle Lakes, Bunker Basin, Pagoda Peak, Troublesome North, Troublesome South, Never Summer South, Never Summer North, Williams Fork, Elkhorn, Dome Peak, South Fork, Gold Creek, Chedsey Creek, Grizzly Helena, Dome, and Chatfield (a total of 338,600 acres) are recommended for wilderness designation. This alternative would recommend five new areas to be designated as wilderness.

Once an area is recommended for wilderness by the Forest Service, Congress makes the final decision. If the Forest determines areas should not be recommended for wilderness, then the Revised Plan determines how these areas will be managed.

Direct and Indirect Effects

Table 3-65 shows how the total roadless area acreage on the Routt was allocated. Table 3-66 displays this same information for the roadless area acreage that was determined to be capable and available for wilderness designation.

Table 3-65. Management Area Prescription Acres by Alternative - All Roadless Areas

Mgmt Rx	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
1.11							
1.12							
1.13							
1.2		128,743		23,239		332,003	
1.32	142,498	240,768	274,800	302,572	67,265		15,816

1.41						146,133	
1.5	2,628	2,801	2,450	2,737	2,809	54	2,660
2.1		7,256	7,307	5,984	782	1,189	2,771
2.2	487	22,054	1,837	28,684	38,083	17	38,083
3.21						13,170	
3.23	14,166	14,389	14,328	14,392	14,404	186	14,531
3.31	22,317	62,571	21,027	56,826	15,461		42,522
3.4			534				
3.55						2,639	
4.2		4,589	6,009	5,165	5,394		6,281
4.3	10,197	2,792	10,684	1,787	4,396	97	16,159
5.11	97,341	4,464	111,846	26,626	166,952	6,547	223,226
5.12	101,631		9,761	269	101,637		63,643
5.13	74,942		21,086	13,996	64,846		56,062
5.21	16,931						
5.41	19,101	8,656	16,724	16,639	16,595	204	16,821
7.1		3,164	3,790	3,324	3,616		3,581

Source: GIS (ARC/Info), roadless inventory and allocation layers

Table 3-66. Management Area Prescription Acres by Alternative - Capable/Available Roadless Areas

Mgmt Rx	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
1.11							
1.12							
1.13							
1.2		128,743		23,239		256,464	
1.32	134,837	148,996	225,371	223,143	66,102		4,659
1.41						74,774	
1.5							
2.1		4,588	4,038	4,853	11		1,083
2.2	487	22,054	1,837	28,684	38,083	17	38,083
3.21						6,522	
3.23	14,166	14,389	14,328	14,392	14,404	186	14,531
3.31	13,984	10,885	11,353	5,381	15,461		29,244
3.4							
3.55						706	
4.2		3,099	4,611	3,821	4,107		4,260
4.3	6,727	1,702	9,987	1,175	3,657	97	14,259
5.11	50,758	838	46,770	11,352	106,213	2,219	159,896
5.12	50,450		1,844	179	36,292		29,901
5.13	50,422		6,458	10,929	42,583		30,769
5.21	3,381						
5.41	15,777	4,681	12,591	12,575	12,695		12,902
7.1		1,015	1,802	1,264	1,378		1,397

Source: GIS (ARC/Info), roadless inventory and allocation layers

The management area allocation can be grouped into two broad categories; those allocations allowing activities which could compromise wilderness characteristics and allocations which generally retain wilderness characteristics. Table 3-67 shows these two groups of allocations. The management area allocations themselves will not directly affect the character of these roadless areas until a planned management activity (e.g. road construction, vegetative treatment) is scheduled. Management activities that change the unroaded character of these areas would require an Environmental Impact Statement and Record of Decision (ROD) before any action could be carried out.

Table 3-67. Roadless Area Allocations

Allocations Retaining Wilderness Characteristics	Allocations Not Retaining Wilderness Characteristics
1.2	4.2
1.32	4.3
1.41	5.11
1.5	5.12
2.1	5.13
2.2	5.21
3.21	7.1
3.23	
3.31	
3.4	
3.55	
5.41	

These groupings were developed from the desired condition statements, standards and guidelines, and overall management emphasis for each management area prescription allocation. In some cases management area prescriptions allow activities, incidental to the overall emphasis of management, which generally are incompatible with wilderness. For example, in Management Area Prescription 5.41 (Deer and Elk Winter Range), roads exist and summer motorized travel is allowed, but the main focus of management is to provide suitable winter range for deer and elk. In these cases the allocation was placed in the "retain wilderness characteristics" group.

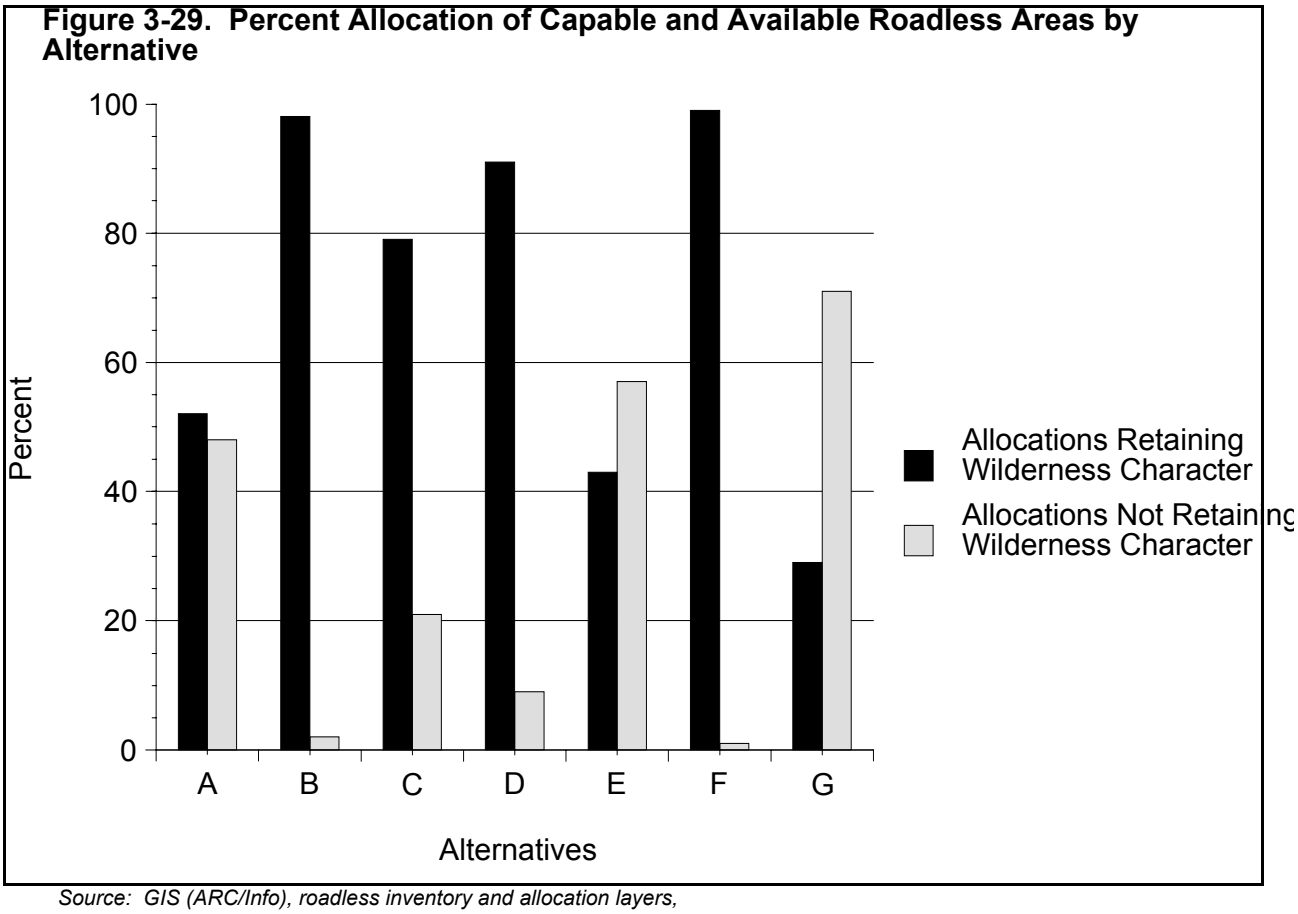
Table 3-68 summarizes the capable and available roadless area acreage for each alternative for these two groups. Acreage in the roadless areas not capable and

available does not currently possess wilderness qualities. Figure 3-29 displays the same information graphically by percent allocation.

Table 3-68. Capable and Available Roadless Areas							
	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Acres Retaining Wilderness Character	179,251	334,336	269,518	312,267	146,756	338,669	100,502
Acres Not Retaining Wilderness Character	161,738	6,654	71,472	28,720	194,230	2,316	240,482

Source: GIS (ARC/Info), roadless inventory and allocation layers

Figure 3-29. Percent Allocation of Capable and Available Roadless Areas by Alternative



Source: GIS (ARC/Info), roadless inventory and allocation layers,

It may be possible to mitigate the loss of wilderness characteristics in some situations. The applicability and practicality of mitigation measures depends on site-specific information and analysis. Possible mitigation measures for timber harvest allocations include road closure or obliteration, modified silvicultural prescriptions, emulating natural patterns and shapes in harvest unit design, and modified logging methods. It may not be possible to mitigate the loss of wilderness characteristics associated with management area prescription 7.1 (Residential/Forest Interface) .

Alternatives F, B, and D allocate the highest amounts of capable and available roadless areas to allocations which generally retain wilderness characteristics. Alternative F

allocates 99%, Alternative B allocates 98%, and Alternative D allocates 91% to these prescriptions.

Alternatives G, E, and A allocate the least amount of roadless areas to allocations which generally retain wilderness characteristics. Alternative G allocates 29%, Alternative E allocates 43%, and Alternative A allocates 52% to prescriptions which retain wilderness character.

Alternative C allocates 79% of capable/available roadless acreage to prescriptions which will generally retain the wilderness character and 21% to prescriptions which will not.

Using the same two groups of management area prescriptions found in Table 3-67, it is possible to divide the total roadless area acreage into two other groups. The first column in Table 3-67 represents those management area allocations generally retaining roadless character, while the second column represents those management area allocations generally not retaining roadless character. Table 3-69 shows the percentage of total roadless area acreage in these groups.

Table 3-69. Percent Total Roadless Area Allocation

	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Acres Retaining Roadless Character	40	97	67	90	31	99	27
Acres Not Retaining Roadless Character	60	3	33	10	69	1	73

Source: GIS (ARC/Info), roadless inventory and allocation layers

Cumulative Effects

The Forest has a high percentage of land (37%) on the roadless area inventory, with an additional 19% in designated wilderness. Several forests within the Rocky Mountain Region have been roaded for timber production to a higher degree than the Routt. This increases the significance of the roadless areas on the Routt. As populations continue to increase in the West and development occurs near Forest boundaries, there will be increased pressure on roadless areas for a variety of uses.

Special Interest Areas

Introduction

Special Interest Areas are managed with emphasis on protecting or enhancing areas of unusual characteristics. These areas are managed to maintain their special interest values. Special Interest Areas (SIAs) are designated as botanical, geological, historical, paleontological, scenic, or zoological areas. SIAs can be designated to protect and mange threatened, endangered, and sensitive (TES) species and other elements of biological diversity or for their emotional significance, scenic values, or public popularity. SIAs can vary from small to large areas.

Legal Framework:

The Forest Plan establishes direction (Management Area Prescriptions) applying to future activities in designated management areas [36CFR 219.11 (c)]. SIAs are one kind of management area. They are managed to maintain the values that made them unique.

Key Indicators:

- Acres and location of SIAs.

Affected Environment

There are eight SIAs that were identified for the Forest. Table 3-70 lists the amount of acres by the various alternatives for the SIAs. Alternative A has no SIAs; Alternative F has one SIA of 1,200 acres. Alternative B has 32,200 acres in five SIAs .

Table 3-70. Acres of SIAs by Alternative (rounded)

Area	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Black Mountain	0	0	760	0	0	0	740
California Park	0	27,270	22,970	17,780	0	0	3,280
Camp Creek	0	1,290	1,200	1,080	1,080	0	340
Encampment River	0	690	620	640	650	0	640
Teller City	0	0	290	0	250	0	250
Little Snake	0	1,650	1,770	1,740	1,650	0	1,650
Windy Ridge	0	1,300	1,090	460	380	1,200	1,310
Horse Park/Moose	0	0	0	0	390	0	390
Total	0	32,200	28,700	21,700	4,400	1,200	8,600

Source: GIS (ARC/Info), allocation layers

Special Interest Areas Proposed for Designation on the Routt National Forest:

Black Mountain, Oliphant and Welba Peaks Area:

This area is proposed for designation because of its geological, zoological, and scenic values. It is located in the northwest portion of the Forest, about 25 miles northeast of Craig. The area contains steep 400-foot cliffs that support raptor nesting sites.

California Park:

This area is proposed for designation for its geological, zoological, historical, paleontological, and scenic values. California Park is a large, high-mountain park located in the northwest portion of forest, about 20 miles north of Hayden. Many species exist there such as greater sandhill crane, sharptail grouse and boreal toads. The area contains unique features such as sulphur springs, fossils, and buffalo skulls. Limber pine can also be found.

Camp Creek:

This area is proposed for designation for its geological, botanical, zoological, and historical values. It is located in the northeast portion of the forest, about 15 miles north of Walden. On the south and west sides of the area are unique, dramatic rock outcroppings. The area supports a highly diverse ecosystem, including old growth Douglas fir, limber pine, and ponderosa pine. Because of this habitat mix, the area can support big-horned sheep, elk, and northern goshawk. The willow and aspen communities support a wide variety of Neotropical migratory songbirds, and moose are beginning to enter the area. There is extensive mining activity.

Encampment River:

This area is proposed for designation for its historical values. It is located in the northern part of the Forest, about 40 miles north of Steamboat Springs. One of the first Euro-American commercial uses of the area was development of a timber industry which supplied railroad ties to the Union Pacific Railroad. Tie cutting camps were established along the Encampment River. The remains of these camps, cabins, and other physical manifestations from the early logging are visible and are significant resources.

Teller City:

This area is proposed for designation for its historical values. Teller City was a silver mining town located in western North Park, Colorado. It was developed during the silver industry boom in the late 1870s and popped up almost overnight to support the influx of miners looking to make their fortune. In 1884, the town went bust when the bottom dropped out of the silver market. Teller City is the largest and best-known heritage site in the area.

Little Snake:

This area is proposed for designation for its botanical values. It is located in the north central part of the Forest, about 40 miles north of Steamboat Springs. It contains relict stands of Ponderosa pine. Presence of ponderosa pine could indicate unique Forest environmental conditions, which might be supporting other plants and/or animals of interest.

Windy Ridge:

This area is proposed for designation for its prehistoric values. It is located in the central part of the Forest, about 30 miles southeast of Steamboat Springs. The Windy Ridge Quartzite Quarry Area is a cultural resource that encompasses more than one square mile. The area has been the site of intense stone tool procurement and manufacture since prehistoric times. A thick vein or band of quartzite is exposed or lightly covered along the highest point of an area known locally as Windy Ridge. The mineral is similar to chert or flint and was used by Native Americans for the manufacture of stone tools.

Horse Park Moose Viewing Area:

This area is proposed for designation for its botanical and zoological values. It is located in the eastern portion of the Forest, about 30 miles southeast of Walden. Horse Park is a wetland complex supporting a peat bog and good amphibian habitat. The area is surrounded by steep hillsides, making the park isolated. The moose viewing site is about 5 miles east of Horse Park along the Illinois River. This was a moose release site and provides for excellent moose viewing opportunity.

Resource Protection Measures:

Forest-wide and Management Area Prescription 2.1 standards and guidelines protect the values for which each SIA was recommended for designation.

Environmental Consequences

General Effects

Designation of SIAs may place certain limits on management activities. The management emphasis is to protect the values that make these areas unique and, where appropriate, to develop the area for public education and use and provide interpretive opportunities.

Direct and Indirect Effects

Effects of proposed SIAs on Range Management: The proposed SIAs are available for grazing provided that it does not conflict with the values for which the area was identified. No allotments are proposed for closure.

Effects of proposed SIAs on Timber Management: The proposed SIAs are not scheduled for timber harvest and do not contribute to the ASQ. Thus, areas of SIAs that are tentatively suitable for timber harvest are removed from the suitable timber

base. Table 3-71 illustrates the approximate number of acres of tentatively suited timberlands within each of the SIAs that would not be available for timber harvest, if they were allocated to management areas 5.11 or 5.13.

Table 3-71. Acres of Tentatively Suitable Timberlands by SIA and Alternative

SIA	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Black Mountain	0	0	356	0	0	0	336
California Park	0	13,910	7,349	7,523	0	0	572
Camp Creek	0	94	66	42	43	0	21
Encampment River	0	474	456	456	456	0	456
Teller City	0	0	27	0	16	0	16
Little Snake	0	458	499	524	458	0	458
Windy Ridge	0	34	70	0	11	302	34
Horse Park/Moose	0	0	0	0	97	0	97
Total	0	14,970	8,823	8,545	1,081	302	3,071

Source: GIS (DWRIS)

Travel Management

Introduction

Travel is associated with virtually every activity that takes place on the Routt National Forest. Travel is necessary for outdoor recreation, fighting wildfires, managing livestock and wildlife, removal of marketable natural resources such as logs and minerals, fuelwood gathering, access to private inholdings, maintaining electronic sites and utility corridors, and management and monitoring of the Forest in general.

Travel management is a tool used to facilitate the movement of people and products. It provides opportunities for the activities listed above and protects resources, mitigates impacts, and minimizes conflicts. Decisions that affect travel opportunities in a given area are emotional issues for many Forest users. Each time a travel management decision is implemented, some users will benefit and others will not. For example, when an area or road is restricted from motorized travel to protect wildlife, there is a secondary effect on people. The closure prohibits motorized travel and protects the wildlife, but it also restricts access for persons with disabilities, limits firewood gathering, and reduces opportunities for some forms of recreation. Conversely, it would likely give hikers, horseback riders, and those viewing wildlife or seeking solitude a more peaceful undisturbed experience.

Modes of vehicle travel on the Forest include large commercial trucks, automobiles, pickups, four-wheel drive vehicles, snowmobiles, all-terrain and off-highway vehicles, motorcycles, mountain bikes, and wheelchairs. Other travel modes include cross-country skiing, horseback riding, and hiking. These various forms of travel may occur on paved highways, gravel and dirt roads, unimproved roads, four-wheel drive roads, and trails designated for motorized and/or nonmotorized use. Off-road and off-trail vehicle travel is allowed only for snowmobiles unless an area is expressly designated open by Forest order. Of particular interest is the emergence of mountain bikes and increased off-highway vehicle (OHV) use since the 1983 Plan.

As use of the Forest increases, travel management will increase in importance as a tool for mitigating impacts on the various resources and for coordinating uses. The Forest needs to work closely with all user groups to maintain travel and recreation opportunities and identify routes where these activities can continue. Public information and education regarding travel management and the need for restrictions must be emphasized. A balance between motorized and nonmotorized recreation opportunities needs to be achieved and is likely to require compromises by each user group to mitigate conflicting demands.

Legal and Administrative Framework

- The Forest and Rangeland Renewable Resources Planning Act Of 1974, Section 10.

Key Indicators

- Miles of roads on the Forest by inventory type.
- Miles of trails on the Forest by inventory type.
- Acres of Forest available for travel opportunities by management area prescription designation.

Resource Protection Measures

The location, design, operation, and maintenance of roads and trails are specified in forest-wide standards and guidelines, Forest Service Manual direction, and Forest Service Standard Specifications. This direction assures that intended use will be accommodated over time.

Maintenance accomplishments on Forest roads are directly dependent upon funding levels.

Affected Environment

Travelways include all roads and trails on the Forest.

Roads

The Forest's inventoried road system includes 2,067 miles of road as shown in Table 3-72. Many of these roads fall under county responsibility for maintenance. Approximately 15% of these miles are outside the Forest boundary and are under the jurisdiction of the counties, but they are considered an integral part of the Forest road system. State and U.S. highways that pass through the Forest are not included in this total. The Forest has maintenance responsibilities for 1,666 of the 2,067 miles.

Table 3-72. Miles of Inventoried Roads on the Routt National Forest by Functional Class

Functional Class	Miles
Arterial roads	382
Collector roads	536
Local roads	1,149
Total miles existing	2,067

Source: Region 2 Transportation Features (R2TF) database

Table 3-73 shows miles of inventoried road by surface type. Approximately 738 miles (69%) of open roads under Forest responsibility have surfaces consisting of the native

material from which the roads are constructed. Some native soil surfaces retain moisture and will rut severely if used when wet. Some are highly erodible and can be easily washed away if proper drainage is not maintained. A few remain fairly stable under normal traffic conditions, even in wet weather.

Table 3-73. Miles of Inventoried Road (Maintained by the Forest By Surface Type and Restriction)

Surface	Restricted\1	Open\2	Total	Percent
Primitive (native)	240	398	638	38
Graded (native)	346	340	686	41
Aggregate	14	326	340	20
Asphalt	0	2	2	1
Total	600	1,066	1,666	
Percent	36	64		100

1 restricted to nonmotorized use, open to motorized use only for specific management activities
2 some miles may be restricted seasonally

Source: Region 2 Transportation Features (R2TF) database

About 326 miles (30%) of open roads under Forest jurisdiction have aggregate surface, which may consist of pit-run or crushed gravel. The expected life of a gravel surface can be 10 to 20 years, depending on the amount and type of traffic and the quality of maintenance. Assuming an average life of 15 years, the Forest should be re-surfacing a minimum of 17 miles per year. Currently, the Forest does not meet that average. Generally, one-third that amount is accomplished annually.

Maintenance of Forest roads varies considerably, depending on the original road design and users. About 70% of Forest jurisdiction miles are not maintained to accommodate passenger car traffic. High clearance or four-wheel drive vehicles are recommended for these roads. An additional 20% are maintained to accommodate passenger cars but do not necessarily provide a comfortable driving experience. The remaining 10% of Forest roads are maintained to accommodate passenger cars and to provide a reasonably comfortable driving experience.

The trend for the future will be fewer miles on the system with a higher standard of maintenance on the arterial and collector roads. This will occur due to the obliteration of lower standard roads and an upgrading of some roads from a medium to higher standard, with perhaps additional surfacing or maintenance.

Trails

The Forest has approximately 922 miles of inventoried trails. Approximately 277 miles of these are located within wilderness. Of the remaining 645 miles, 192 miles (30%) are currently open to motorized use in the summer. Fifty miles of trail, restricted from summer motorized use, are open to snowmobiles in winter.

With few exceptions, trails outside wilderness are open to mountain bikes, though some may not be well suited for mountain bike use. Most of the current trails have native surface and are narrow. The emergence of mountain bikes and off-highway vehicles requires updated management of the current trail system and new considerations in trail design. Trailheads have been recognized as developments that need more planning. Current trail use includes hiking, horseback riding, mountain biking, motorcycles, and off-highway vehicle use. Snowmobiling and cross-country skiing are increasing on marked trails.

Nondesignated Travelways

In addition to roads and trails designated for motorized use, there are roads that have developed through off-road travel, old "temporary" roads that were never obliterated, abandoned roads that were never rehabilitated, and trails developed through use. These routes provide foot, horse, and mountain bike opportunities for those desiring a more challenging experience. These routes are not maintained. They are inventoried and evaluated for possible designation or obliteration during site-specific analyses.

Environmental Consequences

General Effects

Travel management direction on the Forest generally restricts motorized travel to designated roads and trails unless a Forest order specifically allows cross-country motorized travel.

This plan will be implemented by conducting area analysis in watersheds where stream sediment is a concern. New road construction will be limited in these areas. This mitigation of existing conditions is independent of the alternative selected. The application of an area analysis does depend on the alternative selected. Area analyses will provide the site-specific information needed to determine which routes should be designated as motorized routes, which will be obliterated, and which will be restricted to nonmotorized use. Over time, this method will improve the forestwide inventory of roads and trails. This will also provide opportunities to work with user groups when designating motorized trail and mountain bike opportunities on existing travelways while still improving the watershed condition and meeting other resource needs.

Direct and Indirect Effects

There are two main factors affecting changes to the road system. One is effects from changing management area prescriptions. The other is new road construction/reconstruction and obliteration. These changes are summarized in Table 3-74.

Table 3-74. Changes to Road System Miles by Alternative Experienced Budget Level

	A	B	C	D	E	F	G
End of First Decade	1,590	1,522	1,574	1,577	1,592	1,261	1,595
End of Fifth Decade	1,926	1,736	1,846	1,861	1,936	1,301	1,951

Source: FORPLAN and R2TF and Forest Staff

Effects from Management Area Prescriptions - Management area prescriptions will effect new Forest travelways. Maintenance, improvement, and reconstruction of most Forest roads will continue and remain at levels similar to the present depending on the allocation of acres to management areas 1.2 (areas recommended for wilderness), 1.32 (backcountry recreation nonmotorized), and 1.41 (core areas). The number of miles of system roads will remain relatively stable, except for Alternative F. Due to the possible expansion of wilderness areas and creation of large nonmotorized areas, Alternative F will have the most effect on the road system by reducing the total miles of roads open to motorized use by approximately 255 miles (16%). Depending on wilderness designation, these roads could either be obliterated or allowed to develop into single-lane hiking or horseback trails. Alternatives A, B, C, D, E, and G vary little between each other, (as little as -2% to +4% from the total miles of roads).

Road maintenance would vary similarly to the total road miles by alternative.

Effects from Timber Management - Road construction will consist mostly of local roads primarily linked to the amount of timber harvested. The total miles of roads is expected to decline in the first decade in Alternatives B, C, D and F, as obliteration miles are expected to outnumber road construction miles. The largest amount of road obliteration will occur in Alternative F. All other alternatives will have similar road obliteration programs. Table 3-75 displays the estimated miles of road construction, reconstruction, and obliteration for each alternative.

Table 3-75. Miles of Annual Road Construction, Reconstruction, and Obliteration by Alternative - Desired Condition Level.

Roads	A	B	C	D	E	F	G
Construction	25.6	11.1	16.5	17.1	27.9	5.0	24.7
Reconstruction	11.8	8.5	9.9	10.0	12.5	1.3	11.7
Obliteration	20.0	20.0	20.0	20.0	20.0	40.0	20.0

Source: FORPLAN and Forest Staff

Effects to trails from timber management will be minimal. Project or area analyses will be completed for timber sales and mitigation measures identified, if appropriate, to decrease potential negative effects. Potential positive effects might occur if timber harvest activities provide greater access to trails or areas where trails exist.

Effects from Recreation Management - Recreation road construction will be low under experienced budget levels, regardless of alternative. There will be a trend toward fewer miles of high standard road, but those roads will be maintained to a higher standard. In areas of high use, the demand for dust abatement will increase. Surfaces will need to be maintained for the comfort of the user. Conversely, existing low standard roads will receive less maintenance. Primary emphasis on these roads will be safety and resource protection. New road construction and reconstruction mileage will be low in all alternatives.

Trail construction will be low, and reconstruction will continue at or above current levels in all alternatives, depending on available funding. Miles of trail may be added to the system as area analyses are accomplished. Variations among alternatives will relate primarily to the miles of motorized trail available, with Alternatives B and F having significantly fewer miles of motorized trails. There will be slight variations among the remaining alternatives.

Cumulative Effects

In the first decade, miles of roads will decrease in alternatives B, C, D, and F as planned obliteration exceeds new construction. But, roads presently suited for passenger cars will be maintained to a higher standard. The following may occur:

- Use will probably be more concentrated on roads being maintained to a higher standard.
- An increase in maintenance funds will be needed to accommodate the maintenance on these roads.
- Maintenance may require more or better ditch structures, such as culverts, to accommodate access to dispersed camping or other recreation areas.
- More roads maintained to a higher standard should decrease sedimentation from these roads.

- There should be less sediment as roads are obliterated.

Alternatives F and B would have the most effects to the road system, i.e. decreasing the amount of roads and the amount of sedimentation occurring from roads.

Visual Resources

Introduction

Approximately 75% of the Routt National Forest has a natural appearance. Since the 1970s, the Forest has actively managed visual resources according to the agency's Visual Management System (VMS). The VMS was developed to help meet the public's expectation for scenic beauty, while allowing for multiple-resource use in a way that works with natural process to achieve a desired landscape condition.

VMS recognizes that landscapes are in constant change. Motivation for the passage of laws and development of agency direction related to visual resources included the knowledge that aesthetically-pleasing surroundings are essential for human mental and physical health. Numerous studies document the restorative benefits of experiencing natural beauty. Research papers, such as Art Magill's Managed and Natural Landscapes: What Do People Like?, document public preference for natural-appearing landscapes.

The public has been vocal on the importance of maintaining the scenic quality of public lands. Many consider public lands to be part of our nation's aesthetic heritage and advocate the right to experience the same landscapes as their ancestors. The spiritual values of natural beauty are important to many people.

Managing for scenic quality benefits the regional economy. Tourism is a principle economy of northwest Colorado. Numerous studies document that the region's outstanding scenery is the major attraction. Real estate developers understand that condominiums and hotel rooms with scenic views are worth more than units without views. Campsites with scenic views fill up first.

Forest landscape changes occur naturally through catastrophic events, such as avalanches, wildfires, and insect infestations. Landscapes are also changed by human intervention before these events occur, such as logging to reduce insects, fire, and mistletoe. Fire suppression throughout this century has resulted in more even-aged, mature and dense forest stands.

Landscape alterations, such as ski areas, provide a public benefit, but can be visually undesirable. VMS allows for desired landscape alterations while protecting scenic quality. This is achieved by site location and designing modifications which blend with the surrounding landscape. Most proposed activities can be successfully designed to achieve visual quality objectives.

In the Revised Plan, all landscapes are assigned visual quality objectives (VQOs) that define the acceptable alteration of the natural landscapes. The forest-wide direction and guidelines state that all activities shall comply with VQOs and that landscapes not in compliance shall undergo rehabilitation management. This direction helps to assure scenic quality protection.

Legal and Administrative Framework

- The **National Environmental Policy Act of 1969** (NEPA) states that one of the purposes of the act is to assure for all Americans, aesthetically pleasing surroundings. To accomplish this, all federal agencies are to utilize a systematic, interdisciplinary approach which will integrate the environmental design arts in planning and decision-making.
- The **Forest and Rangeland Renewable Resources Planning Act of 1974** (RPA) requires the assessment of potential esthetic impacts and the protection of esthetic resources.
- **Multiple Use Sustained Yield Act** of June 12, 1960.
- **Wilderness Act of 1964** and subsequent Colorado Wilderness Acts.
- **Wild and Scenic Rivers Act of 1968.**
- **National Trail System Act of 1968.**
- **Environmental Quality Act of 1970** and subsequent air and water quality acts.
- **National Forest Management Act of 1976.**
- **Surface Mining Control and Reclamation Act of 1977.**
- Forest Service policy and regulations for visual resources are defined in the Forest Service Manual, Chapter 2380, Landscape Management.

Key Indicators

- Existing Visual Condition (EVC).
- Visual Quality Objectives (VQO).

Resource Protection Measures

Resource protection is provided for in the following USDA handbooks:

- National Forest Landscape Management: Volume 1. Agriculture Handbook 434: 1973.
- National Forest Landscape Management: Volume 2, Chapter 1: The Visual Management System. Agriculture Handbook 462: 1974.
- Utilities, Chapter 2, Agriculture Handbook 478: 1975.
- Range, Chapter 3, Agriculture Handbook 484: 1977.
- Roads, Chapter 4, Agriculture Handbook 483: 1977.
- Timber, Chapter 5, Agriculture Handbook 559: 1980.
- Fire, Chapter 6, Agriculture Handbook 608: 1985.
- Ski Areas, Chapter 7, Agriculture Handbook 617: 1984.
- Recreation, Chapter 8, Agriculture Handbook 666: 1987.

- Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook 701, 1995.

Affected Environment

Astride the Continental Divide, the Forest includes visually unique and spectacular mountain ranges, including the Park, Medicine Bow, Never Summer, Rabbit Ears, Gore, Flat Tops, and Elkhead ranges. The peaks encircle and rise 5,000 feet above the sagebrush valleys and subalpine meadows. Chiseling down from the peaks are many rushing mountain streams, including the spectacular Bear, Elk, and Encampment Rivers. Outstanding stream features include Fish Creek Falls, Kings Canyon of the North Platte River, and numerous wetlands active with beaver and moose. Other scenic features include the historical cowboy swimming hole, Slater Creek Falls, and historic Forest Service guard stations.

Many photographers and visitors consider the wildflower density and variety on the Forest to be among the best in the Rockies. The fall aspen display on Dunckley Pass along the Flat Tops Scenic Byway has been referred to by photographers as one of the top ten in the west.

For approximately seven months out of the year, most of the Forest is blanketed with deep snow. The winter wonderland is viewed by over a million skiers and snowmobilers.

Visual quality is dependent on factors such as air quality and visibility, water quality, forest health, wildlife viewing opportunities, cultural features, and recreation facilities.

Existing Visual Condition

The existing visual condition (EVC) is a baseline inventory describing the present state of visual alteration, which is measured in degrees of deviation from the characteristic landscape.

EVC was not mapped within designated wilderness because it is managed for preservation. Human-caused landscape modifications inside wilderness occurred prior to designation, are of minor visual magnitude, and will be restored according to wilderness implementation schedules. Therefore, all designated wilderness is classified as Type 1 existing visual condition, defined below.

The following are definitions for the EVC categories:

> Type I, Naturally Evolving Landscapes: Areas in which only ecological change has taken place, except for trails needed for access. These areas appear to be untouched by human activities.
>
> Type II, Natural-Appearing Landscapes: Areas in which changes in the landscape are not visually evident to the average person, unless pointed out. The landscape changes appear to be unnoticed.
>
> Type III, Slightly Altered Landscapes: Areas in which changes in the landscape are noticed by the average Forest visitor, but do not attract attention. The natural appearance of the landscape still remains dominant. Alterations appear to be the result of minor disturbances.
>
> Type IV, Moderately Altered Landscapes: Areas in which changes in the landscape are easily noticed by the average forest visitor and may attract

some attention. The landscape changes appear to be the result of disturbances, but resemble natural patterns.

Type V, Heavily Altered Landscapes: Areas in which changes to the landscape would be obvious to the average Forest visitor. These changes dominate the landscape, yet they are shaped to resemble natural patterns when viewed from a distance of 3 to 5 miles or more. They appear to bet he result of major disturbances.

Type VI, Drastically Altered Landscapes: Areas in which changes in the landscape are in glaring contrast to the natural appearance. Almost all Forest visitors would be displeased with the effect. They appear to be the result of drastic disturbances.

Table 3-76 displays the existing visual condition on the Forest. One of the reasons that three-fourths of the Forest is natural appearing is because of the high visual absorption capability. The marbled vegetation mosaic and undulating terrain provide opportunities for locating and designing projects that are not visually obvious. Much of the Forest is extremely steep and has unstable soils. This restricts road construction and other alterations that impact visual quality.

Table 3-76. Acres and Percent Existing Visual Condition on the Routt National Forest

Existing Visual condition	Acres	%Forest
Naturally Evolving landscapes (Type I)	710,700	52.5%
Natural Appearing Landscapes (Type II)	296,500	21.9%
Slightly Altered Landscapes (Type III)	93,400	6.9%
Moderately Altered Landscape (Type IV)	77,200	5.7%
Heavily Altered Landscapes (Type V)	170,600	12.6%
Drastically Altered Landscapes (Type VI)	5,400	0.4%

Source: GIS (DWRIS), Existing Visual Condition layer

Visual Quality Objectives

The Revised Plan assigns all landscapes an adopted Visual Quality Objective (VQO) based on several factors, including the desired landscape condition and other management objectives. The VQO describes the allowable amount of visual alteration. The goal of the visual management system is to have all management activities on the National Forest System lands meet adopted VQOs. Management activities are to be sited and designed to blend with, or complement, the surrounding landscapes. Table 3-77 shows the adopted VQO(s) for each management area prescription.

Three visual resource factors (visual sensitivity, distance zones, and variety class) are mapped to create preliminary VQO maps. These maps were updated to reflect changes since the 1983 Plan. To determine visual sensitivity, the different viewpoints and corridors on the Forest are mapped. The roads, trails, and developed recreation areas with high visitation are classified as Sensitivity Level One. Secondary roads, trails, and other viewpoints are classified as Sensitivity Level Two. Seldom used roads and trails are mapped as Sensitivity Level Three.

Landscapes are divided into three distance zones: foreground (0 to 1/2 mile), middleground (1/2 to 4 miles), and background (4 miles to horizon). Variety class is mapped by a system of landscape character definitions that determine Class A, Distinctive; Class B, Common; and Class C, Minimal. Class A landscapes are the most visually outstanding landscapes in a specific landscape character type. The

determination is made by a comparative analysis of landform, vegetation, and water form.

The visual quality objectives are:

> **Preservation**: Allows only ecological changes. Applies to designated and proposed wilderness, research natural areas, and wild sections of wild and scenic rivers.
>
> **Retention**: Allows only imperceptible changes as seen from viewpoints and corridors. It does not prohibit all activities, but requires them to be sited and designed so they are not noticeable from the identified viewpoints. Retention is applied to foreground landscapes as seen from popular viewpoints and to landscapes that are managed as natural appearing, such as nonmotorized recreation and roadless areas.
>
> **Partial Retention**: All alterations and management activities must remain visually subordinate to the surrounding landscape. Changes are visible, but they do not warrant much attention. Areas typically managed for partial retention are the foregrounds as seen from secondary roads and trails and the middleground as seen from popular viewpoints.
>
> **Modification**: Alterations and management activities may be evident, but they must be of like form, line, color, texture, and scale to the surrounding natural landscape. Modification is usually the objective along less frequently used roads and trails. It is also the objective for background areas as seen from more popular viewpoints and for landscapes where the desired visual condition is modification, such as ski areas and intensely managed timber areas.

Maximum Modification: Alterations and management activities may visually dominate, but they need to be of like form, line, color, and texture to the surrounding landscapes. This objective is not adopted and used on the Forest.

Table 3-77. Adopted Visual Quality Objectives for Management Area Prescriptions	
Management Area Prescription	**VQO**
1.11, 1.12, 1.13, 1.2 Wilderness Series	Preservation
1.32 Backcountry Nonmotorized	Retention
1.41 Core Areas	Retention
1.5 National River System	Retention
2.1 Special Interest Areas	Retention
2.2 Research Natural Areas	Retention
3.21 Limited Use	Partial Retention
3.23 Municipal Watershed	Partial Retention
3.31 Backcountry Motorized Rec	Partial Retention
3.4 National River System - Scenic Rivers	Partial Retention
3.55 Corridors	Partial Retention
4.2 Scenery	Partial Retention
4.3 Dispersed Recreation	Partial Retention
5.11 General Forest/Rangelands	Partial Retention/Modification
5.12 General Rangelands	Modification
5.13 Wood Products	Partial Retention/Modification
5.41 Deer and Elk Winter Range	Partial Retention
7.1 Residential Interface	Partial Retention
8.22 Winter Sports	Modification
8.3 Utility Corridors	Varies with Mgmt Rx

Variety Class

Forest landscapes have been categorized and mapped based on their variety class. Approximately 12% (162,456 acres) of the Forest is classified as Class A. Most of the remainder of the Forest is mapped as Class B. The few Class C landscapes are mostly flat landscapes without views of attractive mountains or water features. Wilderness areas were not classified and mapped because they are managed for preservation and therefore do not need detailed analysis.

The Visual Management System emphasizes protecting Class A landscapes. Some of the Class A landscapes are large areas such as California Park. California Park is surrounded by distinctive peaks, including Saddle and Sugarloaf Mountains and the chain of peaks that create the Continental Divide. Other Class A landscapes are scenic and unique wetland or geologic features, such as the Elkhead Creek Potholes area and the very popular Fish Creek Falls. Special features such as Grizzly Guard Station have also been identified and mapped

Environmental Consequences

General Effects

Downhill Ski Area Development - Alpine ski area development creates the greatest impacts to visual condition on the Forest. Forest vegetation is removed to build ski trails, lifts, and other facilities. These changes in vegetation type from forest to meadow are permanently maintained. In the past, the created openings tended to appear as parallel, vertical lines on the mountains. However, new design standards result in shaped ski trails which appear as natural meadows, avalanche chutes, or other natural openings. Because the visual changes have less contrast with the surrounding landscape, they are of less magnitude. The acres allocated to alpine ski development are approximately the same for all alternatives. The VQOs for alpine ski areas are the same for all alternatives.

Landscapes which are not in compliance with the VQO are placed under the interim VQO of rehabilitation. Rehabilitation activities such as rehabilitating straight lift line clearings and obliterating old service roads should benefit scenic quality.

Effects from Facilities Management - Facilities include Forest Service buildings, dams, and electronic sites. New Forest Service buildings on the Forest are to meet visual quality objectives. This would include architectural and landscape design considerations. New Forest Service buildings off forest lands are designed to meet local design ordinances. The building program does not vary by alternative.

Effects from Cultural Resource Management - Protection of historic features is usually consistent with scenery management. Historic structures such as Grizzly Creek, Hog Park, Michigan River, Pyramid, Seedhouse and Summit Guard Stations, Teller City, Park City, and old mines (Village Belle, Wolverine, and Zirkel mines) are picturesque attractions enjoyed by many forest visitors. Likewise, scenery management is usually compatible with cultural resource management. Notable peaks and other landscape features and attractions are frequently important places for the Utes and other Native Americans. Visual resource management helps to protect these special places. Protection of historic structures with scenic value will not vary by alternative.

Direct and Indirect Effects

Mitigation plans and activities can be required for special-use permit renewal and amendments. New facilities are to meet visual quality objectives. Facility mitigation and construction will not vary by alternative.

Effects from Fire Management - Fire and fire management have affected the visual conditions on the Forest. Vegetation type and condition in many areas are the results of long-term fire suppression. Wildfires, wildfire suppression, and prescribed fires can diminish visual quality; however, past fire activities on the Forest have not resulted in negative visual impacts to areas seen from primary viewpoints. Most fires have been relatively small, and the burned areas have been successfully revegetated.

Fire suppression has resulted in more older trees and standing dead trees and less forest age variety. Because vegetation changes from fire suppression occur slowly, the general public does not recognize them and perceives most of the forest to be natural-appearing. Research conducted on other forests indicates that people prefer larger trees with semi-open understories. Therefore, fire suppression activities have not adversely affected visual resources. However, large catastrophic fires could affect visual quality. This would be the result of additional fuel loading on the forest floor. The

standards and guidelines address minimizing fire suppression disturbance and would help to protect visual quality.

Prescribed fire management varies by alternative. In Management Area Prescriptions, 1.32 and 3.31 (Backcountry Recreation), 1.5 (National River System), and 3.21 (Limited Use), wildfires may be allowed to burn to create larger vegetation patch sizes. Burn scars on trees may be visible from trails and roads as part of trying to recreate natural fire regimes. Alternative F will potentially manage 209,400 acres with prescribed fire techniques. Much of this would likely be in backcountry areas where the existing visual condition is naturally evolving or natural-appearing and the visual quality objectives are primarily retention and partial retention. Visual changes would be noticed after the burn, but would become less noticeable when new grasses, forbs, and shrubs are established.

Effects from Fisheries Management - Water features such as falls, streams, lakes, and wetlands are popular scenic attractions. Because many fish habitat structures and streambank stabilization projects are highly visible, their design is critical to protecting visual quality. Streambank stabilization techniques include reshaping banks, riprap, anchoring trees into streambanks, and others. Native materials, rocks, and logs, are usually used. Visual quality objectives are usually met. The number of stream structures built on the Forest varies; this is not likely to change by alternative.

Effects from Insect and Disease Management - Large insect infestations and diseases that kill or deform forest stands may degrade visual quality. Examples include the beetle kill areas with a high percentage of standing dead trees and mistletoe infestations which have deformed many lodgepole trees on the Forest. When these areas are harvested, the visual quality is reduced until new trees are regenerated. Alternative G would introduce the most in visual changes through timber harvest, followed by E, A, D, C, B, and F.

Effects from Minerals Management - Mining and oil and gas development affects visual quality. The visual impacts on the Routt National Forest are much less than many other forests because most mining on the Forest has been relatively short-term deep-rock mining versus surface or placer mining. The greatest visual impacts have been from road building and, to a lesser degree, timber cutting for pit supports, housing, or other structures.

Most oil and gas developments on the Forest have been well-sited. Most are not visually evident from primary viewpoints. Abandoned drill sites have been successfully revegetated.

The Forest has developed and continues to develop rock sources for forest road maintenance and other uses. A few of these quarries, including Bears Ears and Red Dirt, negatively impact visual quality. Reclamation plans are now completed for all quarry development and expansion. Withdrawals for locatable minerals include numerous areas managed for retention or preservation VQOs. These included developed recreation sites and wilderness. The effects will not vary greatly by alternative, except Alternative F, which proposes large increases in wilderness. These areas would likely be withdrawn from mineral development and therefore protect visual quality.

Effects from Range Management - Range management activities could affect visual quality. For example, improperly located range structures could introduce visual impact.

The quantity of grazing varies little by alternatives. The least visual impact from grazing would occur with Alternative F, which allocates fewer acres to grazing.

Effects from Recreation Management - Visual resources affect recreation resources and vice-versa. Most of the popular developed recreation sites are at or within view of outstanding scenery. Although convenience strongly influences trail usage, so does scenery. People seek outstanding scenery for hiking and other recreational pursuits. The Revised Plan states that new recreation facilities will not be built in Management Area Prescriptions 5.11 and 5.13 (timber production emphasis) to avoid conflict between desired recreation setting and modified visual conditions.

Constructing and managing roads in Management Area Prescriptions 5.11 and 5.13 for motorized recreation may provide visual access into modified landscapes that do not meet some visitors's expectations for visual quality. It may not be possible to provide the desired setting and condition for Management Area Prescription 3.31 (Backcountry Recreation Motorized) in all areas mapped in the alternatives because the existing visual condition in some locations is modified. The preferred alternative has changed the character of the 3.31 management area allocation to better meet current uses. The VQO of partial retention in the foreground along collector roads and primary trails in management area 5.13 may help meet visitor expectations.

Alternatives B, C, D, and F, which propose the greatest acreages managed for primitive and semi-primitive, would likely have the least potential impact from recreation management on visual quality. Alternatives A, E, and G would have the most potential for recreation management to affect visual quality due to larger acreages managed for Roaded Natural and Roaded Modified.

Effects from Travel Management - (include construction, reconstruction, obliteration) Roads are frequently a major factor in landscapes not meeting the visual quality objective. When roads are obliterated, visual quality can be restored by reestablishing natural landforms and native vegetation.

Most forest scenery is viewed from roads. Tourism is a large part of the economic stability in many communities surrounding the Forest, and the Routt National Forest provides a large portion of the amenities for which visitors come to this area. Scenic quality will be maintained along all major travelways on the Forest in all alternatives, with the exception of Alternatives G and E. Most foregrounds, as seen from primary viewpoints along the major travelways, are managed for retention and partial retention VQOs. This will not change greatly by alternative.

In the past decade, less than 20 miles of new permanent roads have been constructed on the Forest. The Revised Plan does not include a large increase in new road construction, although the amount of new road construction would vary by alternative. Alternatives G, A, E, and C would have the greatest increase in new road construction and greatest potential for visual impacts. New roads that are designed utilizing the best management practices for visual resource protection and enhancement will meet the visual quality objectives.

In locations with intensive timber and/or other management activities, the roads are left open. This provides public access to some highly modified landscapes. If these roads were obliterated after the harvest or other activity, there would not be developed visual access into these areas. Most public demand for access into these areas seems to be for firewood and hunting. For these people, the modified visual condition is usually

acceptable. For the sightseeing public, however, these areas usually do not meet visual expectations. Alternative F proposes obliterating the most miles of road.

Effects from Timber Management - Newly created openings in existing stands of trees modify the landscape. There would be greater levels of change where landscapes currently have no visible changes. In alternatives E and G, landscape changes through timber activities and associated road building would occur in 10,000 acres currently classified in existing visual condition Type I , Naturally Evolved Landscapes and Type II , Naturally Appearing Landscapes. Type I and II landscapes modified by timber cutting and roads would be changed to Type III , Slightly Altered Landscapes; Type IV, Moderately Altered Landscapes; or Type V, Heavily Altered Landscapes.

The timber management practices, as proposed in the Revised Plan, offer changes that may better serve visual resource protection. There will be more uneven-aged management, especially in spruce/fir. Although the cutting will likely be less obvious, the road network will remain in place to provide re-entry.

Most of the timber management in lodgepole and aspen will be even-aged. Clearcutting is desired in lodgepole for a variety of reasons, including the reduction of mistletoe and for better stand regeneration. However, clearcutting in lodgepole is the most difficult timber management practice to mitigate visually. These stands frequently are consistent in age and density and do not have natural openings or mixed mosaic patterns typically found in spruce/fir and aspen.

Areas allocated to Management Area Prescription 5.13 have greatest potential to impact visual quality due to timber management activities. Alternatives G, E, and A have the greatest potential to impact visual quality due to timber management activities (including any associated road building), followed by Alternative D, C, and B, and F.

Effects from Utilities Corridors - Acres allocated to utility corridors are the same for all alternatives. Sections of several powerlines do not comply with the visual quality objectives. The rehabilitation of these sections would meet the VQOs.

Effects from Vegetation Management - The effects of vegetation management on visual quality have been addressed primarily under effect analyses for fire, range, timber, and wildlife management. New ecosystem management practices may include larger timber cuts, no suppression of wildfire, prescribed fires, and other management to alter vegetation patch size and other factors.

The standards and guidelines for vegetation in Management Area Prescriptions 5.11 and 5.13 define the amount of live trees, snags, and log and woody debris to be retained after harvest. Especially in foreground landscapes, these actions must be carefully implemented if the visual quality objective is to be maintained. Live trees and snags should be left in natural-appearing islands. Down logs and other woody debris should not be stacked in piles in foreground landscapes.

Effects from Wilderness Management - Wilderness management maintains visual quality. Therefore, Alternatives F and B, which recommend the largest increases in wilderness, would have the least potential impact to visual quality.

Effects from Wildlife Management - Wildlife management activities can negatively affect visual quality if they include ground-disturbing activities. Scenery resource and wildlife management can be compatible. Vegetation screening maintained for wildlife cover around created openings also helps to protect visual quality. Viewing wildlife enhances visitor enjoyment. Many wildlife management activities can be visually

mitigated by saving snags in clumps; designing openings, ponds, and nesting and habitat structures to be natural-appearing; siting openings to be screened from viewpoints by topography and/or vegetation; and by other techniques.

Wildlife management activities will not vary greatly in all the alternatives, except Alternative F. Alternative F would result in the least habitat improvement structures and therefore, create the least impact on visual resources from wildlife management.

Cumulative Effects

The plan is not likely to result in a large increase in negative cumulative visual impacts on and off the Forest. For all alternatives, many of the landscapes that do not comply with the VQOs are out of compliance due to cumulative effects. This is particularly true for landscapes in which the existing visual condition is Type V, Heavily Altered Landscapes and Type VI, Drastically Altered Landscapes (Table 3-76).

The Revised Plan resulted in updating existing visual condition maps which, when used to plan additional activities, will be beneficial to protecting visual quality. The Revised Plan also calls for visual monitoring and rehabilitation of landscapes that do not comply with VQOs. If implemented, these will reduce the likelihood of negative cumulative impacts to visual resources on the Forest.

The greatest cumulative effects on visual resources would most likely occur in Alternatives G, E, and A. These alternatives have the largest acreage allocated to Management Area Prescription 5.13 (Forest Products).

Public concern has been expressed about regional visual cumulative impacts on public lands resulting primarily from ski-area based construction, reservoir developments, and electronic facilities on peaks. The quantity of these facilities and developments do not vary by alternatives.

The Yampa Valley in the Steamboat Springs area is undergoing rapid changes in visual condition. An analysis of the viewshed indicates that most of these changes are on private land. Rural residential development on private lands adjacent to the Forest is increasing. These structures are seen from National Forest lands. Likewise, residents in these adjacent developments view the National Forest. Their expectations for scenic quality may impact future forest management.

The Revised Plan will continue to protect the scenic places most often visited. Meeting the VQOs will help to protect regional tourism. Because all national forests utilize the Visual Management System, the most valued scenic places on these public lands will be maintained.

Wild and Scenic Rivers

Introduction

For a river to be included in the Wild and Scenic Rivers System, it must meet the tests of eligibility and suitability. To be eligible, a river must be free-flowing and possess river values which are judged to be outstanding and remarkable. To be suitable, the benefits of designation should outweigh the disadvantages. It involves considering the land ownership in the area; the land uses that would be affected; public, state, and local

government interest in the river's designation; estimated costs; and any other issues raised during the planning process.

Legal and Administrative Framework

The Wild and Scenic Rivers Act of 1968 established national policy to "preserve selected rivers or sections thereof in their free-flowing condition, to protect water quality of such rivers and to fulfill other vital national conservation measures." The act also states that these rivers "shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

The Wild and Scenic Rivers Act, as amended (December 31, 1992), and Forest Service Handbook 1909.12, Chapter 8 direct the Forest Service to evaluate rivers for inclusion in the National Wild and Scenic River System during forest planning.

Key Indicators

- Number of miles and location of eligible rivers.

Resource Protection Measures

The following resource protection measures will be used in potential classifications, to specify interim management direction for the eligible rivers (no recreational rivers were identified).

Eligible Wild Rivers:

- Timber Production - Cutting of trees will not be allowed unless needed to meet management objectives (trail clearing or fire control).
- Water Supply/Flood Control - No major diversions or other structures will be allowed in the channel or river corridor.
- Mining - New mining claims and mineral leases are prohibited within one-quarter mile of the river. Valid claims would not be abrogated. Existing mineral activity must be conducted to minimize surface disturbance, sedimentation, and visual quality. Reasonable access is allowed.
- Road Construction - No new roads and no motorized travel will be allowed outside designated routes.
- Recreation Development - Major public-use sites (campgrounds, administrative buildings) are located outside the Wild River corridor.
- Utilities - New transmission lines, gas lines, and water lines are discouraged. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way.

Eligible Scenic Rivers:

- Timber Production - Silvicultural practices may be allowed within the river corridor, provided such practices do not have substantial adverse effects on the river or the corridor landscape. Timber outside the river

corridor is managed and harvested with a special emphasis on visual quality.

- Water Supply/Flood Control - Major diversions and flood-control dams are prohibited.
- Mining - Subject to regulations 36 CFR 228, new mining claims and mineral leases could be allowed and existing operations allowed to continue, provided mineral activities minimize surface disturbance, sedimentation, and pollution and maintain the visual character of the landscape.
- Road Construction - Roads may occasionally bridge the river area. Short, conspicuous road stretches or longer, inconspicuous, and well-screened road stretches could be allowed.
- Recreational Development - Public-use sites (moderate-sized campgrounds, administrative facilities) are allowed, provided they are outside the river floodplain and screened.
- Utilities - New transmission lines, gas lines, or water lines are discouraged. Where no reasonable alternative exists, additional or new facilities are restricted to existing rights-of-way.

Affected Environment

The 1975 amendment to the Wild and Scenic Rivers Act designated two rivers on the Routt National Forest for study and potential addition to the National Wild and Scenic Rivers System: the Elk and Encampment Rivers. Both suitability studies were documented in separate environmental impact statements prepared in 1979. The President recommended inclusion of the Encampment River and the Elk River, except for the lower 6 miles. Congress has not yet taken action on the President's recommendations. Both rivers were protected in the 1983 Plan from activities that could diminish their eligibility for designation. The Elk and Encampment Rivers are both still eligible and suitable and their protection will continue under the Revised Plan.

All rivers and streams on the Forest were assessed to determine eligibility for inclusion into the National Wild and Scenic River System. Each stream found eligible for inclusion in the system will be managed to maintain its eligibility until a detailed suitability study is completed. Individual suitability studies will be completed when:

- There is Congressional interest in a specific river for Wild and Scenic designation.
- There is a proposal which would alter the free-flowing character of the stream (i.e. reservoir construction).
- Strong local interest or support is demonstrated for Wild and Scenic designation.

For each stream found eligible, an estimate of the potential future classification (wild, scenic, or recreational) was made. The types of classification are:

- Wild - Rivers or sections of rivers that are free of impoundments, with watersheds or shorelines essentially primitive; generally inaccessible except by trail, with undisturbed landscapes.
- Scenic - Rivers or sections or river that are free of impoundments with watersheds or shorelines still largely primitive and undeveloped; can be accessible in places by inconspicuous, well-screened local roads.
- Recreational - Rivers or sections of river that are readily accessible by road or railroads and have some degree of development along their shoreline where minor structures are allowed, provided the waterway generally remains natural in appearance.

Table 3-78 displays the results of the inventory and evaluation of streams on the Forest for eligibility. Refer to Appendix E, Wild and Scenic Rivers, for location maps of the three rivers, in addition to the Elk and Encampment, which were identified in the inventory as eligible rivers.

Table 3-78. Streams Eligible for Inclusion into National Wild and Scenic River System

Stream or River Name	Length (Miles)	Outstandingly Remarkable Values	Potential Classification
North Platte River	5.0	Scenic Recreational Fish	Wild
Roaring Fork Creek /Red Canyon Creek	2.6 2.3	Scenic Geologic Wildlife	Wild
Lower Rock Creek	5.1	Scenic Geologic Fish Wildlife Prehistoric Culture	Wild
Elk*	29	Scenic Recreational	Wild Scenic
Encampment*	19.5	Fish Wildlife	Wild
Total Number Miles	63.5		

*The Elk and Encampment Rivers are both eligible and suitable.

Environmental Consequences

General Effects

Alternative A provides protection for the Elk and Encampment rivers only, a total of 48.5 miles. All 63.5 miles of eligible rivers are protected in Alternatives B, C, D, E, F, and G.

The river management prescriptions allocated to these river corridors places management constraints on the type of activities which can take place within the river corridors. These rivers are identified in Management Area Prescriptions 1.5 or 3.4 (wild or scenic rivers), which protect their characteristics and values.

Direct and Indirect Effects

Effects from Minerals Management - Mineral or energy exploration and subsequent development could have an effect on the character of river segments. Eligible wild rivers will be withdrawn from mineral entry. New claims or leases are prohibited within 1\4-mile of the river. Within eligible scenic river corridors, existing valid mining claims and new mining claims are allowed with restrictions that protect the river resources.

Effects from Range Management - Livestock use would not affect the river's eligibility for nomination, but range improvements must be compatible with a wild or scenic designation. The period of occupancy and number of livestock allowed within the river corridor may be affected in order to protect the riparian areas and wetlands.

Effects from Recreation Management - Recreation developments and facilities will be prohibited in rivers designated wild.

Effects from Road Management - The alternatives that provide for construction of more roads have the greatest potential to change the character of river corridors. No new roads and no motorized travel is allowed outside designated routes within 1/4 mile of eligible wild river corridors. Motorized travel can occur within eligible scenic river corridors, but travel is restricted to existing roads and trails.

Effects from Scenic Management - Positive effects on potential wild and scenic rivers are expected from scenic resource management. River segments determined eligible will be treated as sensitive viewing zones.

Effects from Timber Management - Timber management has the potential to change the character of rivers and the adjacent areas. Within eligible wild river corridors, the cutting of trees will not be allowed unless needed to meet management objectives (such as trail clearing or fire control). Eligible scenic river corridors allow vegetative treatment of timber stands, as long as the treatment meets recreation or scenery objectives. Vegetative treatments outside all river corridors can be accomplished with an emphasis on meeting scenery objectives.

Cumulative Effects

Designation of the 5 eligible rivers on the Forest could lead to an increase in river-related recreation. Regionally, it would not significantly increase the amount of recreation use. Non-designation would not affect the amount of river-related or dispersed recreation uses on the Forest, but would represent a lost opportunity to have representative streams in Colorado as part of the National Wild and Scenic River System.

Wilderness

Introduction

The Wilderness Act of 1964 established the National Wilderness Preservation System. It mandates these areas be "administered for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness."

Wilderness areas are typically at the heart of the watershed and at the headwaters for major river systems. Inside the boundary, they are protected from development, including the construction of roads, dams, or other permanent structures; from timber cutting; and from the operation of motorized vehicles and equipment. Outside the boundary, multiple use continues, including logging, road building, development, and in many cases, private land development.

Only since 1984, have wilderness areas been protected from new mining claims and mineral leasing inside the boundary (USDA Forest Service, 1989). During the 1964 debates, Congress stipulated that unless current grazing permits and mining claims are protected, there would be no wilderness. As of 1984, new mining claims cannot be developed, but active mines are allowed to continue operation.

Wilderness provides quality outdoor recreational opportunities, maintains gene pools which provide diversity of plants and animals, protects geological and archaeological resource values, artifacts and structures, and serves as a living laboratory for medical and scientific research.

As stated in the Rocky Mountain Wilderness Management Philosophy (a handbook for consistent wilderness management), the concept of wilderness management is a paradox. While wilderness conveys impressions of freedom, of land beyond control of man, its management suggests control and manipulation. In today's world, however, wilderness can only be preserved by deliberate management to minimize human influences.

Wilderness resource management generally concentrates on human use within the boundaries. Since the Wilderness Act became law, millions of people have visited designated wilderness areas in North America. Use is increasing but at a decreasing rate since the 1980s. Estimates of use are not perfect, but there appears to be more frequent day use which impacts trails closer to trailheads near population centers. Wilderness use accounts for 3-4% of total forest recreation use.

Legal and Administrative Framework

- Wilderness Act (1964)
- Flat Tops Wilderness Act of 1975
- Colorado Wilderness Act of 1980
- Wyoming Wilderness Act of 1984
- Colorado Wilderness Act of 1993

Key Indicators

- Acres designated as wilderness.

Resource Protection Measures

The Wilderness Act established the National Wilderness Preservation System. Under any alternative, forest-wide standards and guidelines for wilderness apply. These include a policy of nondegradation of the wilderness resource.

Affected Environment

The Wilderness Act set aside nine million acres of National Forest System lands as wilderness, including the Mount Zirkel Wilderness on the Routt National Forest. The major change occurring on the Routt National Forest since the 1983 Plan has been the

enactment of the Colorado Wilderness Bill in 1993. The Forest now manages 265,119 acres of designated wilderness. Wilderness is separated into three categories: pristine, primitive and semi-primitive. Wilderness areas on the Forest are displayed in Figure 3-41. This accounts for 19.6% of the Forest. Table 3-79 illustrates the wilderness establishment history on the Forest.

Table 3-79. Wilderness Acres on the Routt National Forest

Law	Wilderness	Acres on the Routt
1964 Wilderness Act	Mount Zirkel	72,180
1975 Flat Tops Wilderness Act	Flat Tops	38,870
1980 Colorado Wilderness Act	Mount Zirkel	67,718
	Never Summer	6,659
	Neota	*267
	Rawah	*1,462
1984 Wyoming Wilderness Act	Platte River	743
1993 Colorado Wilderness Act	Sarvis Creek	47,140
	Mount Zirkel (Davis Peak)	20,750
	Byers Peak	8,095
	Vasquez Peak	1,235
Total wilderness acres on the Forest		265,119

*Administered by the Arapaho and Roosevelt National Forests

Source: Wilderness Acts

Each designated wilderness on the Routt National Forest is described in the following section.

The Flat Tops Wilderness

Currently, 38,870 acres of this 235,230-acre wilderness located in northwest Colorado is administered by the Routt National Forest. The White River National Forest administers the remaining acreage. This wilderness area is approximately 140 miles west of Denver and 140 miles east of Grand Junction. Access is provided along US Highway 40 to the north and Interstate 70 to the south.

The topography on top of the area is relatively flat. The middle and western portions are characterized by blown down dead spruce which restrict off-trail travel. On the east side, there are vast stretches of alpine tundra which provide excellent opportunities for solitude and off-trail travel.

Recreation has increased steadily during the 1970s and 1980s. Use (mostly by day hikers) along the Devil's Causeway is increasing dramatically. Hunting is increasing as well but at a slower pace. There are presently 167 miles of Forest Service trails within the Routt portion of this wilderness.

Most wilderness campsites have been informally established by visitors over the years and are considered primitive. Some popular camping areas are suffering adverse impact from heavy use indicating the need for visitor education on "leave no trace" camping. Visitor education has been augmented through increased field presence and information available. Films aired weekly on the local television stations, public talks, videos, brochures, and personal contact are part of the public information program.

Commercial outfitting and guiding accounts for 1% of all use in the wilderness. Commercial users are issued permits for temporary camps.

Livestock grazing is also a traditional use. There are 7 allotments on the Routt side of the Flat Tops, with grazing occurring on 12,034 acres. Range conditions are considered to be fair to good.

Water quality is high and water quantity sufficient for maintaining wilderness values and providing a supply for off-site uses.

The Yampa Ranger District has completed a capacity study for most of this wilderness. A Wilderness Implementation Schedule (WIS) has also been completed. There is currently no approved fire management plan and no air quality monitoring plan in effect for this wilderness. All fires have been suppressed. Active mining does not occur in this area.

Big game species include elk, mule deer, bighorn sheep, black bear, and mountain lion. Federally listed species that occur in the Wilderness include the bald eagle and peregrine falcon. There are 50 or more lakes within the wilderness and over 100 miles of fishing streams. Species of fish include rainbow trout, Colorado River cutthroat trout, eastern brook, and lake trout.

Never Summer Wilderness

The Never Summer Wilderness is located approximately 18 miles north of Granby, Colorado. It is bounded on the west by the Routt National Forest, on the east by Rocky Mountain National Park, and on the south by the Arapaho/Roosevelt National Forest. This wilderness totals 14,100 acres, with Routt National Forest administering 6,659 acres. Private ownership within this wilderness totals 301 acres.

Elevations vary from 8,944 to 12,810 feet. The area is forested with lodgepole pine, spruce, fir, and aspen. Most of the area is above timberline, with alpine meadows and tundra along the high ridges and peaks. This wilderness straddles the Continental Divide, just west of Cameron Pass. It has 17 peaks over 12,000 feet in elevation.

The Never Summer Wilderness receives varying degrees of visitor impact, mostly illegal campsites and campfires at Bowen Lake. Much of the area is remote. There are over 12 miles of trail. Included is a portion of the Continental Divide National Scenic Trail which provides access to most of the wilderness area. Outfitted use accounts for 6% of total use in the area with hiking and hunting permits.

The Never Summer Wilderness is part of the moose re-introduction program. The Colorado Division of Wildlife has been monitoring their activities, and the District has kept a photographic log of damage to trails and campsites. Lakes contain Colorado River cutthroat, rainbow, and brook trout. The area had mining activity early in the century, and old mines are still visible.

Mount Zirkel Wilderness

The Mount Zirkel Wilderness contains 160,870 acres. It includes part of the Park Range along the Continental Divide. Elevations range from 9,000 feet to over 12,000 feet. The headwaters of the Encampment, Elk, and North Platte Rivers are located in this wilderness area.

Air quality and visibility are major issues in the Mount Zirkel Wilderness, as described in the air section of this chapter. The extent of the Park Range and Mt. Zirkel Wilderness creates a need for cooperation among county governments in terms of air quality monitoring and active fire management programs. There is no current fire management plan for this area.

There is no consistent program for interdisciplinary resource monitoring. Other issues include insufficient staffing to monitoring visitor use and provide visitor education and the increasing encroachment by snowmobiles along the wilderness perimeter.

Recreation opportunities include camping, hunting, fishing, horseback riding and hiking. Approximately 149 miles of trails provide access to the area. Wilderness use is increasing along some easily accessed trails close to Steamboat Springs, due, in part, to marketing programs, and the increase in day use. The two managing Districts have worked at rehabilitating over-used campsites and any trails that are causing other resource concerns.

Commercial use of the Mt. Zirkel Wilderness includes livestock grazing on 12,000 acres (10 grazing allotments) and 13 outfitter and guide operations. Only 8% of total use is attributed to outfitters and guides. The Forest hopes to complete a capacity analysis by 1999 which may re-route outfitter use out of heavily used areas.

There is an active fish stocking program in this wilderness. Big game species found in the wilderness include elk, mule deer, black bear, and bighorn sheep. No known threatened and endangered species are present.

Sarvis Creek Wilderness

The Sarvis Creek Wilderness is located southeast of Steamboat Springs. This area contains 47,140 acres and is characterized by broad slopes covered with spruce-fir, lodgepole pine, and aspen. The area is dissected by three major tributaries of the Yampa River. All of this wilderness is located below timberline. Elevations range from 7,000 to 10,700 feet. The climate consists of relatively short summers and cold winters with a heavy snow pack.

Recreation opportunities include hunting, fishing, hiking, camping, and horseback riding. There are approximately 20.2 miles of trail. Use primarily occurs along two main trails, Service Creek and Silver Creek. Since the Colorado Wilderness Act became law in 1993, managers report an increase in day use, hunting, and overnight camping. Outfitted operations, including hunting, rock climbing, and horseback rides, account for 5% of total recreational use.

There is currently no approved fire management plan, no air monitoring plan, no patented mining operations, and an incomplete wilderness implementation schedule. Grazing occurs on 4 allotments covering 6,700 acres. Livestock grazing is a historic use of this wilderness, and range conditions are considered good.

Big game include, elk, deer, and black bear.

Vasquez Peak Wilderness

The Vasquez Peak Wilderness contains 12,300 acres. The Routt National Forest administers 1,235 acres located in Grand County, southwest of Fraser, Colorado. Primary access is by County Road 148, which leaves US Highway 40 at Winter Park. This wilderness is set between the Fraser Experimental Forest to the west, Winter Park Ski Area to the east and the Continental Divide to the south. Vasquez Creek, with headwaters originating on the Continental Divide, is the major drainage.

This area is characterized by broad steep slopes and is heavily forested with Engelmann spruce, subalpine fir, and lodgepole pine at the lower elevations along Vasquez Creek. A portion of this wilderness is above timberline, with elevations ranging from 8,600 to 12,000 feet.

Water quality for this wilderness is excellent. An existing tunnel, which is part of the Denver Water Board development, passes under part of this wilderness area.

Recreation activities include hunting, fishing, camping, horseback riding, and hiking. The wilderness receives moderate recreation use. Little user information has been collected since designation in 1993.

Big game species found in the area include elk, mule deer, mountain goat, and black bear. No threatened and endangered species are found. Vasquez Creek supports a small population of brook trout.

Byers Peak Wilderness

Byers Peak Wilderness is nestled between the Fraser and Williams Fork Rivers. It is characterized by glacially carved ridges and cirque basins that are covered with talus rock and low-growing alpine vegetation. Below this are narrow drainages forested with lodgepole pine, Engelmann spruce, and subalpine fir. It features two picturesque, subalpine lakes and various panoramic views of surrounding mountain ranges.

There are 38 miles of trail in and around this wilderness, creating a network of loop trails. These loops help manage trail use and provide diversity in terrain and viewing opportunities. Currently, 2% of total use is provided by outfitters and guides. These include overnight pack trips and daily horse rides.

Platte River Wilderness

The 23,492-acre Platte River Wilderness was created following the passage of the Wyoming Wilderness Act of 1984. Seven hundred and forty three acres are in Colorado on the Routt National Forest and 22,749 are in Wyoming on the Medicine Bow National Forest. Surrounded by sagebrush flats, the main focus of the Colorado portion is the North Platte River drainage.

Rafting is the primary recreational activity. Commercial rafting accounts for over 50% of total use. Use is dependent on runoff. During most of the 1990s, water levels were low, with occasional high water periods, making river outfitting on the North Platte a high-risk business. Rafting opportunities are typically limited to the first 2-3 months during the spring and early summer. However, when there is sufficient runoff and sustained late-season flows, illegal outfitting is becoming more prevalent. There has been a steady loss of recreational values along the river due to high use in a short period of time.

Camping in the Platte River Wilderness is limited due to the canyon terrain. There is a problem with encroachment by motorized vehicles and bicycles because of a lack of boundary markers. This wilderness boundary has not yet been surveyed. Trail use is limited to the Wyoming side of the wilderness. Fishing is becoming more popular in this area due to its designation of as "blue ribbon" trout stream.

There is currently no air quality monitoring plan and no fire management plan. Range conditions are considered good on two permitted grazing allotments. User conflicts primarily result from a lack of understanding of the grazing permitted inside wilderness areas under the 1964 Wilderness Act. Visitor education programs are needed for this issue, specifically.

Identified threatened and endangered species present include bald eagles (transitory use). A breeding pair of bald eagles have been noted on the Wyoming side of the wilderness.

Motorized encroachment along the west side of the wilderness is a concern. There are also problems with illegal outfitting. A river ranger is on duty during the heavy-use season along the river, but violators are difficult to identify once on the river.

Supply and Demand

Assessment of demand for wilderness is a difficult task since it involves many possible uses, some of which do not easily lend themselves to traditional measures. Public perception of benefits from wilderness tend to be tied to hunting, fishing, photography, sightseeing trips, research, etc. However, for some people, simply knowing that wilderness exists and that it will be available for future generations is a benefit (Hass et al. 1986).

Nationally, use figures are variable, and increases are difficult to predict. Historically, wilderness use increased since the 1960s due to the creation of a wilderness preservation system, decreased in the 1980s, and is increasing again in the 1990s. Colorado wilderness use figures on national forests are also increasing after a decline in the 1980s and early 1990s. There were 1.7 million recreation visitor days (RVDs) in 1983, 1.2 million RVDs in 1989, and 1.4 million RVDs in 1993 on national forests in Colorado. Trends on the Routt follow use trends in Colorado and nationwide, showing steady increases until the mid-1980s and declines in the late 1980s and early 1990s. Since 1993, use has gradually increased, primarily because of the changing age structure and changing interests and preferences of the recreating public.

A 1986 wilderness values survey of Colorado residents indicated that preservation of the air, water, and wildlife habitat is very important to off-site residents. The most important reasons for designating wilderness among on-site respondents included protecting water quality and wildlife habitat. Protecting future air quality and knowing that future generations would have wilderness (Haas et al. 1986) were also listed and were of equal importance to on-site respondents.

According to the Forest's Wilderness Needs Assessment, neither the Regional Guide, nor a four-year visitor use study on the Routt National Forest, indicate a need for additional wilderness. The assessment of wilderness supply is challenging since the act of recommending an area for wilderness designation does not necessarily translate into the creation of a wilderness.

Potential wilderness supply on the Routt National Forest includes the 260,400 acres of existing wilderness, plus an additional 502,245 acres identified as roadless. Of those roadless areas, 340,990 acres were found capable and available for wilderness. Each roadless area is described in Appendix C. Management Area 1.32 also includes areas generally considered suitable for wilderness and would be protected, and consequently, available for future consideration.

Environmental Consequences

General Effects

Monitoring impacts from uses in and out of wilderness are all part of management. Recreation is by far the most common type of use of the wilderness system, therefore most wilderness management deals with impacts from human use. Wilderness resource management generally concentrates on managing human use within the boundaries.

Disturbances to wilderness natural conditions include fire suppression, livestock grazing, exotic species introduction (inadvertent or deliberate), mining, and atmospheric and water pollution with their respective complications (Cole 1994).

There is no difference in total wilderness acreages among alternatives. Area restrictions presently in effect for resource protection in impacted areas will be applied in each alternative. All alternatives will provide education opportunities to encourage low-impact camping methods and use the Leave No Trace program to maintain a quality wilderness experience.

Direct and Indirect Effects

Effects from Fire Management - Air quality and fire management were major public concerns based on comments received on the 1995 draft RPA program (USDA Forest Service - Geary et al. 1997). In a 1987 wilderness values survey, they were ranked extremely important to Coloradans. Air quality objectives in the wilderness and managing for a natural fire regime may be in conflict.

Air particulates are directly tied to visibility, and as a consequence, there is a conflict with managing for clean air within a natural fire regime.

Fire treatment outside wilderness can help to reduce the threat of insects and disease inside the wilderness. Insect and disease outbreaks contribute to the fuel load by killing trees. The use of prescribed fire to restore a natural regime would be used according to the individual fire management plan. Fire outside wilderness would occur most in Alternatives G, E, A, D, C, B, and F.

Human-caused fires (inside or outside the wilderness) threaten the success of restoring a natural fire regime. As areas become more accessible to recreationists, the likelihood of a human-caused fire increases. Public access to otherwise nonmotorized areas is highest in Alternatives G, E, and A, followed by C, D, B, and F.

Effects from Heritage Resource Management - Under any alternative, heritage resource management and historic preservation may result in the retention and maintenance of historic properties that would otherwise be allowed to deteriorate.

Effects from Minerals Management - Under any alternative, designated wilderness is withdrawn from energy leasing and mineral entry, subject to existing rights.

Effects from Range Management - The potential effects from grazing in wilderness include trampling and the encroachment of exotic species in sensitive areas (high altitude areas, areas with species that are sensitive to use of any type). Grazing activities, in accordance with allotment management plans and the proposed forest plan standards and guidelines, would continue in the wilderness to the extent that they do not degrade the resource.

Effects from Recreation Management - Managing the recreation resource is the most obvious management activity in wilderness. Certain recreation uses are enhanced by a wilderness environment, but most just occur there. Day-hiking for fitness can occur anywhere, so most users choose the trail less likely to be crowded, and most scenic. Trends in recreation use indicate higher levels of day use and use on weekends, but overall, use levels are increasing at a slower rate.

The effects of recreation on wilderness include soil erosion, water quality degradation, vegetation trampling, use conflicts, and reductions in wildlife habitat. Rather than

developing additional trails and campsites, managers have begun assessing individual situations with regard to an area's resilience, resistance, and level of concern.

Recommended additions to the Wilderness Preservation System are based on the suitability and availability criteria in the roadless report (Appendix C) and the amount of substitute opportunities for a quality wilderness experience (Management Area Prescription 1.32). Table 3-80 compares the recommended acres by alternative.

Table 3-80. Areas Recommended for Wilderness and Backcountry Nonmotorized Recreation by Alternative

Routt							
(M Acres)	A	B	C	D	E	F	G
1.2	0.0	120.4	0.0	24.3	0.0	302.5	0.0
1.32	119.3	243.9	261.7	304.7	59.1	0.0	20.3
Williams Fork							
(M Acres)	A	B	C	D	E	F	G
1.2	0.0	10.2	0.0	0.0	0.0	36.1	0.0
1.32	46.6	28.2	31.2	16.2	22.4	0.0	0.0

Source: GIS (ARC/Info), allocation layers

Additions to the wilderness system would mean additional quality nonmotorized opportunities on the Forest. Alternative F would add 120% more to the wilderness acreage on the Forest. The effects of more than doubling the amount of wilderness on the Forest would mean a shift in recreation opportunities. Use on the Forest would be dominated by nonmotorized wilderness recreation. Motorized recreation uses would shift to other parts of the Forest and to nearby BLM and state forests.

Alternatives B, D, and F also provide substitutions for wilderness in other areas. This could reduce use levels inside the wilderness system by dispersing users to other areas. Alternatives A, E, and G would provide for the least amount of substitute areas for a nonmotorized, unconfined recreation experience. Alternative C would provide more active management of existing unroaded areas. In all alternatives, there would be an emphasis on protection of remoteness, solitude, and other resource values in management area 1.32.

In recent years, trails outside wilderness have been upgraded or reconstructed with the help of trail machines. This is not an option on wilderness trails. As use increases (even at a slow pace), trails will continue to deteriorate. Many users will be diverted off trails, creating even more trails or braiding the trail. Water quality is a concern where campsites are adjacent to lakes and streams.

Motorized recreation in areas adjacent to the wilderness can be a concern for managers because of inadvertent or purposeful encroachment inside the wilderness boundary. Not only is motorized use against the law, but it imposes on other users. This, in turn, adds to a volatile situation of user conflicts. Opportunities for motorized use of wilderness can be minimized by building fewer roads near the boundary and by enlisting adjacent landowners as partners to protect against these encroachments. Alternatives G and E would have the most potential trespass opportunities, given the amount of acres allocated to Management Area Prescription 5.13 (Forest Products) and surrounding existing wilderness. They would be followed by Alternatives A, D, C, B, and F.

Effects from Research Natural Areas (RNAs) - In general, the RNA designation is complementary and compatible with wilderness management. In Alternatives B, C, D, E,

F, and G, where there is dual management of the Research Natural Areas within wilderness, use may be limited, and there will be restrictions on new trail construction. Existing trails will be maintained to reduce erosion and protect the resource.

Effects from Timber Management - Logging and related road-building activities near the wilderness boundary has the potential to affect use levels by creating potential motorized entry points from old logging roads. Use in areas adjacent to the existing and recommended areas change with road building. In the short term, noise levels ruin the perception of being in a remote area. This would be a change from a semiprimitive nonmotorized to a roaded modified or semiprimitive motorized experience. Alternatives G, E, and A would provide more opportunities for this type of encroachment into the wilderness areas on the Forest, followed by D, C, B, and F.

Effects from Visual Management - The emphasis on scenic resource protection is similar among alternatives. Alternatives A, E, G, C, and D allow the greatest degree of landscape alteration on lands adjacent to the wilderness and have the greatest potential to adversely affect the experience of wilderness visitors. Alternatives B and F would have the least impact.

Effects from Threatened, Endangered, and Sensitive Species Management - Recreational use within wilderness areas may be regulated where or when it threatens recovery of any threatened, endangered, or sensitive species or impacts critical habitat.

Effects from Wildlife and Fisheries Management - Under all alternatives, activities for fish and wildlife management in wilderness areas will be conducted according to the policies and guidelines set in the Memorandum of Understanding of the International Association of Fish and Wildlife Agencies. This includes guidelines pertaining to threatened and endangered species, chemical treatment, and fish stocking. All activities are conducted in accordance with the Wilderness Act's purpose of protecting natural processes.

Cumulative Effects

User conflicts over land ethics and a perceived encroachment on other peoples' values threatens the future of the Wilderness Preservation System. There is an overall lack of understanding of the many values of wilderness, including economics. Wilderness designations preclude other management activities and many people are unaware of the secondary effects of the designations. When there is an interruption to a traditional way of life or traditional uses stemming from inherent wilderness restrictions, those most affected will naturally fight against any further wilderness designations.

Conflicts over use types, fire, grazing, adjacent uses, and air pollution will continue to accelerate unless additional resources are provided for monitoring, as per the goals of the original Wilderness Act (Geary and Stokes 1997). Alternatives B, D, and F allocate more and different amounts to wilderness. Before these areas can be set aside, quality baseline and trend information is needed for all biological, physical, and social values in order to prevent the occurrence of unacceptable changes.

Production of Natural Resources

- Minerals
- Range
- Timber

Minerals

Introduction

Mineral resource use on the Routt National Forest has been limited and sporadic in nature. Mineralization is concentrated (in a few scattered areas). Activity has fluctuated with demand, and current low prices for many minerals has dampened exploration and development.

The Forest Service manages mineral-related activities consistent with multiple-use management principles. The agency integrates the exploration, development, and production of mineral and energy resources with the use, conservation, and protection of other resources.

Legal and Administrative Framework

Policy toward mineral activities on National Forest System lands is guided by statutes and expressed in statements by the President of the United States, the Secretary of Agriculture, and the Secretary of Interior.

- **The General Mining Law of 1872** allows exploration, development and production of minerals from mining claims located on public domain lands.
- **The Mineral Lands Leasing Act of 1920** established leasing system for the acquisition of coal, phosphate, oil, oil shale, gas and sodium.
- **Mineral Leasing Act for Acquired Lands of 1947** extends the provisions of the mineral leasing laws to Federally-owned mineral deposits on acquired National Forest System lands and requires the consent of the Secretary of Agriculture prior to leasing.
- **The Surface Resources Act of 1955** allows the sale of mineral materials such as sand and gravel and provides direction for the multiple-use of surface resources of mining claims.
- **The Federal On-shore Oil and Gas Leasing Reform Act of 1987** gives the Forest Service authority to conduct a leasing analysis and decide which lands to authorize for leasing.

- **The Endangered Species Act of 1973** requires the protection of habitat for endangered species.

Key Indicators

- Acres available for oil and gas leasing.
- Acres by leasing stipulation for oil and gas leasing.
- Reasonable foreseeable development for oil and gas production.
- Acres open to locatable mineral entry.

Resource Protection Measures

Locatable minerals

36 CFR 228 requires the mining claimant to file an operating plan or notice of intent for proposed mining activities. The plan must include the name and address of operators, a sketch or map of the location, descriptions of operations, access, timing, operating period, and environmental protection measures. The Forest would work with the claimant to assure that standards and guidelines in the Forest Plan are met. The operating plan requires an environmental analysis and decision before the plan is approved.

Leasable minerals

The staged approach to oil and gas leasing, exploration, and development allows for analysis and mitigation of effects on other resources at each stage . Leasing is the first stage in this process. A lease in and of itself does not permit ground-disturbing activity, but because it conveys certain rights to the lessee, any mitigation measures necessary to protect other resources from ground-disturbing activities need to be addressed before the lease is issued [36 CFR 228.102 (c)]. Consequently, the "leasing stage" level of analysis identifies effects on other resources from potential activities (See the 1993 Oil and Gas Leasing Analysis Environmental Impact Statement, Appendices B and C) and specifies necessary restrictions, if any, beyond those imposed by standard lease terms (See the 1993 Oil and Gas Leasing Analysis Environmental Impact Statement, Appendix A). Stipulations attached to leases specify such restrictions which are known to potential lessees prior to the time a lease is sold. At such time as industry requests a lease, new information or changed circumstances might require changes to the mitigation measures specified in the "leasing stage" analysis. These changes are disclosed in an environmental analysis and decision document before the requested parcel can be leased.

At the second stage, that of drilling an exploratory well, the Forest Service has the responsibility and authority to approve the Surface Use Plan of Operations (SUPO), with conditions, as part of the Application for Permit to Drill (APD) (36 CFR 228.107 and 228.108). Environmental analysis of the proposed drilling project identifies effects on other resources from the proposed activity and specifies mitigation consistent with Forest Plan direction, terms of the lease, and direction provided in 36 CFR 228.108. Approved mitigation measures are included as conditions of Approval (COA) with the SUPO. The Forest Service must approve the SUPO as part of the APD (for which BLM provides final approval) with COA's (mitigation measures) before the well can be drilled.

At the third stage, that of developing a discovered resource, the Forest Service has the responsibility and authority to approve the surface use part of a development plan, which could include any number of one or more wells. Environmental analysis of the proposed

development project identifies effects on other resources from the proposed activity and specifies mitigation measures consistent with Forest Plan direction, terms of the lease, and direction provided in 36 CFR 228.108. Identified mitigation measures are included as COA's with an approved development plan and an approved SUPO and APD for each well. Development activity can proceed only after the Forest Service and BLM have approved the development plan with specified mitigation measures.

Forest Service and BLM personnel must conduct periodic inspections of exploratory and development drilling operations and production activities to ensure compliance with mitigation measures (36 CFR 228.112) and other applicable regulatory authorities.

Affected Environment

Statutory and regulatory direction separate mineral resources in lands owned by the United States into three categories: locatable, leasable, and mineral materials.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the Mining Law of 1872 (as amended). Locatables are referred to as hardrock minerals. Examples include deposits of iron, gold, silver, lead, zinc, copper and molybdenum. The public has the statutory right to explore for, claim and mine mineral deposits found on federally owned lands subject to the U.S. mining laws. Through a memorandum of understanding with the BLM, the Forest Service administers most aspects of operation of U.S. mining laws on National Forest System lands.

Approximately 35% of the Forest can be classified as having a high-to-moderate potential for locatable minerals. Most of the production of these minerals is concentrated within a few areas on the Forest. (Refer to the Mineral Appraisal of the Routt National Forest prepared by the Bureau of Mines, for more specific information.)

The Forest has averaged three small mining operations on the Forest per year. They are very seasonal in nature and usually include no motorized excavation equipment. Exploration, development, and production of locatable minerals will continue to be dependent on market prices and supply and demand of the commodity.

Withdrawals are approved in areas in which mineral activity may be in conflict with other management objectives. Table 3-81 displays the reasons for withdrawals and the acreage.

Table 3-81. Existing Locatable Mineral Withdrawals

Type of Withdrawal	Acres
Special designated areas	285,834
Federal Energy Regulatory Commission	11,750
Roadside zones	2,413
Dams, reservoirs	87
Ski areas	7,619
Recreation areas	7,412
Power projects	800
Administrative sites	1,395
Campground/picnic areas	1,371
Total	318,681

Source: Mineral Withdrawals Central File Routt Supervisor's Office

Designated wilderness areas are congressionally withdrawn from entry for all minerals exploration, development, and production activities.

Leasable Minerals

Federally owned leasable minerals include fossil fuels (coal, oil, gas, oil shale, etc.), geothermal resources, potassium, sodium, carbon dioxide, and phosphates. These minerals are subject to exploration and development under leases, permits, or licenses granted by the Secretary of the Interior. The principal statutes are the Mineral Lands Leasing Act of 1920 as amended, the Mineral Leasing Act for Acquired Lands of 1947, the Geothermal Steam Act of 1970, and the Federal On-shore Oil and Gas Leasing Reform Act of 1987. The Secretary of the Interior's authority is administered by the BLM. When National Forest System lands are involved, the Forest Service has the authority and responsibility to determine which lands are available for leasing. The Forest Service is also responsible for prescribing lease terms that provide protection of the surface resources and values. The Secretary of the Interior has the authority to administer operations on National Forest System lands leased, licensed, or permitted. The Office of Surface Mining is responsible for coal, and the BLM is responsible for other minerals.

Direction in the Federal On-shore Oil and Gas Leasing Reform Act of 1987 required that the Forest determine availability of lands for leasing. The leasing analysis was completed in 1993 for all areas on the Forest that had high-to-moderate potential for oil and gas production (607,000 acres). Specific information can be found in the Oil and Gas Leasing Analysis Environmental Impact Statement. An additional 189,400 acres (Zone 4) of low-potential land is analyzed in the Environmental Impact Statement for the Revised Plan. Approximately 363,000 acres of nonwilderness land has no potential for oil and gas production; applications for oil and gas leases in these areas must have specific on-site environmental analysis before they will be accepted. (Note: Acres vary slightly from those shown in the Oil and Gas Leasing Analysis and in the DEIS for the Revised Plan. With the exception of Alternative C, which had a change in management area prescription allocation, the change in numbers is only due to the use of a different Geographic Information System than was used previously)

Currently, three wells are in production on the Forest. However, extensive oil and gas activity has occurred on lands adjacent to the Forest. Exploration and development for oil and natural gas is expected to increase over the coming years. Technological advances in interpretation and data gathering methods could result in more activity and heavier impacts in favorable areas. Attendant facilities, such as roads, pipelines and electric power transmission lines, would be necessary as wells are brought into production.

Potential for development of coal resources on the Routt National Forest is low. There are no coal mines on the Forest. Areas of the Forest determined to be suitable for coal development will require site- and project- specific environmental analysis prior to leasing and exploratory activity. Mitigation measure for protection of other resources and forest uses will be analyzed and specified at such time as industry requests a lease.

The United States Geological Survey (USGS) has identified three areas on and near the Forest as being prospectively valuable for geothermal resources: Steamboat Springs, Brand's Ranch, and Hot Sulfur Springs. Most of the actual springs in these three areas are on private lands, with many of the recharge areas on the Forest. One of the springs, within the city of Steamboat Springs, has been developed as a commercial bath. No geothermal leases have been issued on the Forest to date. Proposals for geothermal

leasing and development will be considered at the time they are proposed, and site- and project-specific environmental analysis, including identification of mitigation measure for protection of other resources and forest uses, will be performed at that time.

Mineral Materials

Mineral materials, or common variety minerals, are generally low-value deposits of sand, clay, and stone that are used for building materials and road surfacing. Extraction of these materials from the National Forest System Lands is at the discretion of the Forest Service. The major controlling statutes are the Mineral Materials Act of 1947 and Surface Resources Act of 1955. Requirements controlling mineral material operations are similar to those for leasable minerals.

Potential aggregate sources have been identified across the Forest. The demand for gravel will increase as campgrounds, forest roads, and county roads are improved. Sources to meet private needs are available off-Forest.

Environmental Consequences

Direct and Indirect Effects

Locatable Minerals

The areas with high geologic potential for discovery of locatable minerals include the area from Big Creek Lakes to Steamboat Lake and from Clark up the Elk River to the Continental Divide. These areas within the Mount Zirkel Wilderness are withdrawn from mineral activity. Prescriptions in the high-potential areas outside of the wilderness are common to all alternatives and have little impact on the number of acres available for mineral activity. The exception to this is Alternative F which has a larger acreage withdrawn from mineral activity. The following management area prescriptions are withdrawn from locatable mineral entry:

- 1.11 Wilderness, Pristine.
- 1.12 Wilderness, Primitive.
- 1.13 Wilderness, Semi-primitive.
- 1.2 Areas Recommended for Wilderness.
- 1.41 Core Areas
- 1.5 National River System
- 2.1 Special Interest Areas (when necessary to protect the values of the management area prescription)
- 2.2 Research Natural Areas (RNAs)
- 3.21 Limited Use
- 3.23 Municipal Watersheds
- 3.55 Corridors
- 8.22 Ski Based Resorts: Existing/Potential

Table 3-82. Locatable Mineral Withdrawals by Alternative				
Alternative	Acres Withdrawn	Percent Withdrawal	Acres Available	Percent Available
A	292,400	21%	1,006,200	79%
B	481,500	35%	877,100	65%
C	321,200	24%	1,037,400	76%
D	371,400	27%	987,200	73%
E	340,000	25%	1,018,600	75%
F	1,23,000	83%	235,600	17%
G	344,400	25%	1,014,200	75%

Source: GIS (ARC/Info), oil and gas stipulations and allocation layers

Alternative F has the most area withdrawn from locatable mineral entry at 83%. Alternative B is next at 35%. Alternative A withdraws the least at 21%. The remaining Alternatives are all closely grouped between 24% and 27%.

Leasable Minerals

In 1993 the Forest completed the Oil and Gas Leasing Analysis for areas with the greatest potential (moderate to high) for oil and gas development. The areas analyzed were termed as geographic zones 1, 2, and 3 (see Figure 3-42). Geographic Zone 4, which has low potential for oil and gas development, was analyzed during the Revised Plan process. The environmental consequences for Zone 4 are displayed within this section of the EIS. The remainder of the Forest is Geographic Zone 5 and contains no potential for oil and gas production. Applications for oil and gas leases in Zone 5 will not be accepted without specific on-site environmental analysis.

Geographic Zones 1, 2 and 3

This area was previously analyzed in the Oil and Gas Leasing Analysis. To complete this analysis, the Forest needed to determine the reasonable foreseeable post-leasing activity or the reasonable foreseeable development (RFD). The RFD is a projection based on historical and existing oil and gas activities, leasing patterns, industry interest, potential for fluid mineral occurrence, USGS estimates, and professional judgments. BLM and Forest Service geologists developed the RFD. Table 3-83 displays the RFD for each geographic zone. For more information on the RFD, see Appendix C in the Oil and Gas Leasing Analysis.

Table 3-83. Drilling Activity Forecast for Geographic Zones 1-3		
Zone	Exploration Well	Development Well
1	9	4
2	7	8
3	6	5
Total	22	17

Source: RFD

The stipulations found in the Oil and Gas Leasing Analysis have been adjusted to reflect the revised mineral leasing standards for each management area prescription for all alternatives, except Alternative A. Stipulations for Alternative A are those identified in the Oil and Gas Leasing Analysis. Table 3-84 displays the minimal leasing stipulation for each management area prescription. See Appendix E of the Revised Plan for an explanation of the leasing stipulations.

For any area, if the stipulation determined by the leasing analysis was more restrictive than the management area prescription standard, the oil and gas leasing stipulation was applied. For example, the oil and gas leasing analysis determined areas with hydric soils would have a leasing stipulation of controlled surface use (CSU). If an area with hydric soils had a management area prescription of 5.12, the leasing standard is standard terms. However, since CSU is more constraining than standard terms, areas with hydric soils within management area prescription 5.12 would have a leasing stipulation of CSU. The one exception to this is areas in the oil and gas leasing analysis that had a stipulation of no surface occupancy (NSO) because it was to be managed as a roadless area. In this case, the management area prescription (which determines whether or not an area will be managed as a roadless area) standard is applied.

Table 3-85 displays the acres of oil and gas leasing stipulations for Zones 1-3 for each alternative. Alternative A and C have the most acres available for leasing. Alternatives D, E, and G have slightly less acres available because of a proposed RNA within geographic Zone 3. Compared to Alternative A, Alternative B has 74,800 fewer acres available for leasing because of recommended wilderness in geographic Zones 2 and 3. Alternative F has the least amount of acres available because of recommended wilderness, core areas, and corridors in geographic Zones 1, 2, and 3.

Table 3-84. Management Area Prescription Stipulations for Oil and Gas Leasing

Management Area Prescriptions		Stipulation
1.11	Wilderness, Pristine	UN
1.12	Wilderness, Primitive	UN
1.13	Wilderness, Semi-primitive	UN
1.2	Areas Recommended for Wilderness	UN
1.32	Backcountry Recreation - Nonmotorized	NSO
1.41	Core Areas	UN
1.5	National River System	NSO
2.1	Special Interest Areas	CSU
2.2	Research Natural Areas	UN
3.21	Limited Use	NSO
3.23	Municipal Watershed	NSO
3.31	Backcountry Recreation - Motorized	NSO
3.55	Corridors	UN
4.2	Scenery	CSU
4.3	Dispersed Recreation	CSU
5.11	General Forest and Rangelands - Forest Vegetation Emphasis	SS
5.12	General Forest and Rangelands - Range Vegetation Emphasis	SS
5.13	Forest Products	SS
5.21	Water Yield	SS
5.41	Deer and Elk Winter Range	TS
7.1	Residential/Forest Interface	CSU
8.22	Ski Based Resorts: Existing/Potential	UN

Stipulations:

UN - Unavailable for oil and gas leasing
NSO - Available for oil/gas leasing with no surface occupancy stipulation
CSU - Available for oil/gas leasing with controlled surface use stipulation
SS - Available for oil/gas leasing with standard stipulations
TS - Available for oil/gas leasing with timing stipulations

Note: Management area prescriptions in the CSU, SS and TS categories may contain further restrictions based on site specific protection needs.

The amount of NSO for each alternative varies, mainly due to the allocation of roadless areas. Alternatives D and B have the greatest amount of NSO, with an increase by 43,200 acres in Alternative D and 36,100 acres in Alternative B. The increased NSO is due to the retaining of most roadless areas in a backcountry recreation prescription. Alternative C has slightly less acres in NSO, due to the management of roadless areas. Alternatives E, F, and G have significantly lower amounts of NSO (more than 100,000 acres). For Alternative F, much of the areas that were NSO in the leasing analysis are unavailable. The decrease in NSO under Alternatives E and G is due to the allocation of roadless areas to prescriptions other than backcountry.

The RFD would not change for Alternatives C, D, E, and G. The RFD for Zone 2 in Alternative B would be somewhat reduced because of the allocation of the Pagoda Peak roadless area to recommended wilderness. It is estimated that the RFD for this zone would be reduced to a total of seven wells, three exploration and four development. Under Alternative F, the RFD for all zones would be greatly reduced. Approximately 65% of the area would be unavailable, reducing the potential for development. The effects from Alternative F would be very similar to the alternative that addressed no leasing in roadless areas (Alternative 4) in the Oil and Gas Leasing Analysis. In the leasing analysis, the RFD for Alternative 4 was changed to a total of seven wells in Zone 1, six wells in Zone 2, and six wells in Zone 3. See Chapter 4 of the Oil and Gas Leasing Analysis for the consequences of this alternative.

Table 3-85. Oil and Gas Leasing Stipulations for Zone 1-3

	A	B	C	D	E	F	G
Unavailable	36,500	111,300	36,500	41,600	41,100	416,500	41,100
SE - PVT 1/	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Total Unavailable	40,700	115,500	40,700	45,800	45,300	420,700	45,300
SE - FS 2/	4,000	4,000	4,000	4,000	4,000	4,000	4,000
NSO	223,900	259,800	216,300	266,900	93,300	89,200	64,700
CSU	152,600	101,700	160,600	139,700	214,000	31,500	218,300
CSU and Timing	21,900	24,300	28,200	24,400	30,900	6,500	31,700
Timing	26,100	24,600	33,000	30,000	36,400	12,600	40,100
Standard Terms	137,800	77,100	124,200	96,200	183,100	42,500	202,900
Total Available	566,300	491,500	566,300	561,200	561,700	186,300	561,700
Grand Total	607,000	607,000	607,000	607,000	607,000	607,000	607,000

1/ Split Estate with Federal Surface and Private Minerals (No authority to lease)
2/ Split Estate with Private Surface and Federal Minerals (Lease on site specific basis)
Source: GIS (ARC/Info), overlay of allocation, oil and gas zone, and oil and gas stipulations layers

Geographic Zone 4

Geographic Zone 4 has low potential for oil and gas development and encompasses approximately 189,400 acres. This area was not previously analyzed in the 1993 Oil and Gas Leasing Analysis. For Zone 4, the leasing analysis is provided here as part of the Revised Plan process in order to meet the requirements of 36 CFR 228.102 (c).

The RFD for Zone 4 was developed at the same time as the RFD for Zones 1-3. The RFD for Zone 4 was determined to be zero exploration wells and zero development wells. In order to analyze leasing effects, the RFD was changed to one exploration well and one development well.

For Zone 4, the leasing analysis in the Revised Plan process has met the requirements for a leasing analysis found in 36 CFR 228.102(c). Oil and gas leasing supplemental stipulations have been identified and mapped on site-specific basis to a 40-acre level of accuracy. No new stipulations have been used. The mapping process, resource assumptions, and stipulation justification can be found in the 1993 Oil and Gas Leasing Analysis.

Two leasing decisions are made in the Revised Plan for Zone 4: the Lands Administratively Available for Leasing Decision, 36 CFR 228.102(d) and the Leasing Decision for Specific Lands, 36 CFR 228.102(e), (subject to the verification process defined in the regulations).

Oil and gas leasing regulation 36 CFR 228.102(c)(2) requires one of the alternatives analyzed to be that of not allowing leasing. This alternative was analyzed in the leasing analysis for Zones 1- 3. The no-leasing alternative for Zone 4 is reflected in Alternative F.

The National Environmental Policy Act (NEPA) requires one of the alternatives to be analyzed to be No Action. No action in this case would be to go with the leasing analysis of 1993 for Zones 1-3 and site-specific analysis for the available areas in Zone 4. The no action alternative for Zone 4 is reflected in Alternative A.

For the remaining alternatives (B, C, D, E, and G), oil and gas leasing stipulations were generated using a two-step process. The leasing stipulation was first identified based on protection of other resources and following the process used in the leasing analysis for Zones 1-3. The leasing stipulation was then adjusted to reflect the standards of the management area prescription allocation for each alternative (see discussion above for Zones 1- 3).

Table 3-86 displays the acres by stipulation for Zone 4 for each alternative.

Table 3-86. Oil and Gas Leasing Stipulations for Zone 4

	A	B	C	D	E	F	G
Unavailable	20,400	31,100	22,400	31,100	22,800	186,100	22,800
SE - PVT 1/	3,100	3,100	3,100	3,100	3,100	3,100	3,100
Total Unavailable	23,500	34,200	25,500	34,200	25,900	189,100	25,900
SE - FS 2/	300	300	300	300	300	300	300
NSO		51,900	33,100	36,900	13,800	0	17,400
CSU		53,400	62,700	59,900	72,900	0	75,600
CSU and Timing		9,600	12,200	10,500	14,700	0	14,100
Timing		12,300	17,300	15,600	20,000	0	18,700
Standard Terms		27,700	38,300	32,000	41,800	0	37,400
Site Specific	165,600	0	0	0	0	0	0
Total Available	165,900	155,200	163,900	155,200	163,500	300	163,500
Grand Total	189,400	189,400	189,400	189,400	189,400	189,400	189,400

1/ Split Estate with Federal Surface and Private Minerals (No authority to lease)
2/ Split Estate with Private Surface and Federal Minerals (Lease on site specific basis)
Source: GIS (ARC/Info), overlay of allocation, oil and gas zone, and oil and gas stipulations layers

Alternatives C, E, and F have the most acres available for leasing. Alternatives B and D show a reduction in acres available, because of the allocation of areas to recommended wilderness that are within Zone 4. Alternative F has no acres available to leasing. All leasing decisions for Zone 4 under Alternative A would be made on a case-by-case basis, with specific on-site environmental analysis.

As was the case for Zones 1-3, the amount of NSO stipulation found under any alternative was due to the management area prescription allocation for inventoried roadless areas. Alternative B has the most acreage in NSO because it retains most roadless areas in a backcountry prescription. Alternatives C and D have less acreage in NSO, due to the allocation of some roadless areas to management area prescriptions other than backcountry. Alternatives E and G have the least amount of NSO. Alternative G allocates most and Alternative E allocates all roadless areas to management area prescriptions other than backcountry.

The RFD would not change for any alternative except Alternative F. Alternative F would have no development.

The 1993 Oil and Gas Leasing Analysis displays the effects of oil and gas leasing on each resource. Because the stipulations for Zone 4 were determined using the same process as the 1993 Leasing Analysis, the effects would be similar to those displayed in that document (see Chapter 4 of the Oil and Gas Leasing Analysis). Because Zone 4 has low potential for oil and gas development and a low RFD, the effects would be reduced. This section will differ in that it will display effects to resources from potential leasing in Zone 4. For more detailed information, see the 1993 Oil and Gas Leasing Analysis.

Effects to Water/Riparian - Oil and gas development has the potential to adversely affect water quality and overall stream health by adding sediment and/or toxic substances from road and pad construction and drilling activities. Potential exists for spills of drilling fluids and the oil and gas products entering surface and ground waters.

As stated in CFR 228.108(j) "the operator shall not conduct operations in areas subject to mass soil movement, riparian areas, and wetlands." Based on this, the effect of the oil and gas operations on riparian areas would be mitigated for all alternatives.

Based on the RFD, the effects from oil and gas development in Zone 4 would be very minimal. The amount of disturbance from the two wells is estimated to be 21 acres (based on assumptions as stated in Appendix C of the Oil and Gas Leasing Analysis).

Effects to Range - The effect of oil and gas development as projected under the various alternatives would be very similar. The major effects on the range resource are short-term: the temporary removal of forage because of well pad or road construction and the possible alteration of livestock distribution on allotments due to road construction.

Grazing capacity might be slightly reduced until areas impacted are restored to their former production level. Most grazing allotments in the analysis area can stand short-term effects without grazing adjustments, primarily due to stocking ratios, good range conditions, and short seasons. Seeding of road cuts, fills, and borrow pits would minimize the loss of available forage.

Effects to Soils - There would be fewer effects from oil and gas leasing in Zone 4 due to the number of wells. The mitigation measures and best management practices (BMPs) would protect the soil resource.

Effects to Air - Air quality would be affected by future oil and gas development. Effects would be short-term and would include engine emissions from drilling activities, possible emissions from flaring gas during well testing, and release of gases during drilling. The amount of development forecast for Zone 4 would not have a significant effect on the air resource.

Effects to Wildlife and Sensitive Species - The resource protection stipulations will prevent most adverse effects to wildlife and sensitive species from oil and gas development. However, it is reasonable to assume that alternatives with the most acres available for leasing pose the greatest risk. Alternatives C, E, and G have the most acres available, followed by B and D. Alternative F does not allow leasing in Zone 4, so there would be no possible adverse affect to wildlife and sensitive species with this alternative.

Geographic Zone 5

The remainder of the Forest, geographic Zone 5, has no potential for oil and gas production. Leasing will occur on a case-by-case basis following site-specific analysis. Much of Zone 5 is not available for leasing because of wilderness, campgrounds, etc.

Mineral Materials

Common variety minerals may be sold for fair market value or disposed of through free use in any of the proposed alternatives.

Cumulative Effects

Oil and gas leases have numerous environmental requirements to comply with applicable laws and regulations. To minimize effects to other resources, lease stipulations are applied to oil and gas development. The lease stipulations are described in Appendix E of the Revised Plan. When leasing restrictions are combined, oil and gas development is adversely affected. Under no surface occupancy restrictions, drilling cost would increase because of directional drilling requirements. Seasonal restrictions under timing stipulations could result in access times being too short for effective exploration and development programs. Controlled surface use stipulations also could increase the cost of exploration and drilling. The cumulative effect of lease restrictions could hinder or prevent oil and gas development in certain locations within the Forest.

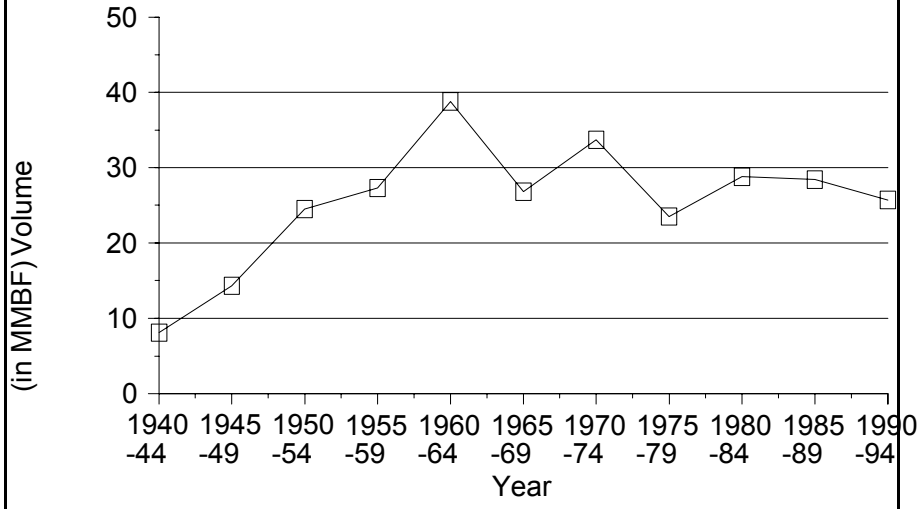
Areas that are unavailable to oil and gas development would result in a loss of domestic oil and gas production. It would also result in a loss of lease rental fees and royalty revenue to the United States government and taxpayers.

Timber Production

Introduction

Before the Routt National Forest was established, timber was harvested on the Forest to meet the needs of the people living in the area. Accurate records of timber harvest exist from 1940 to the present. Figure 3-43 displays the total volume of timber harvested on the Forest from 1940 to 1994. Timber harvest on the Forest increased after World War II to meet the demands of a rapidly growing economy.

Figure 3-43. Historic Timber Harvest Volume*



*Total harvest volume includes sawtimber, posts, poles and fuelwood.

Even though timber harvest has been a common activity on the Forest, much of the forested lands have not been cut. Approximately 60% of the Forest has remained unroaded. In addition, a large portion (60%) of the forested land is comprised of mature size classes.

Legal and Administrative Framework

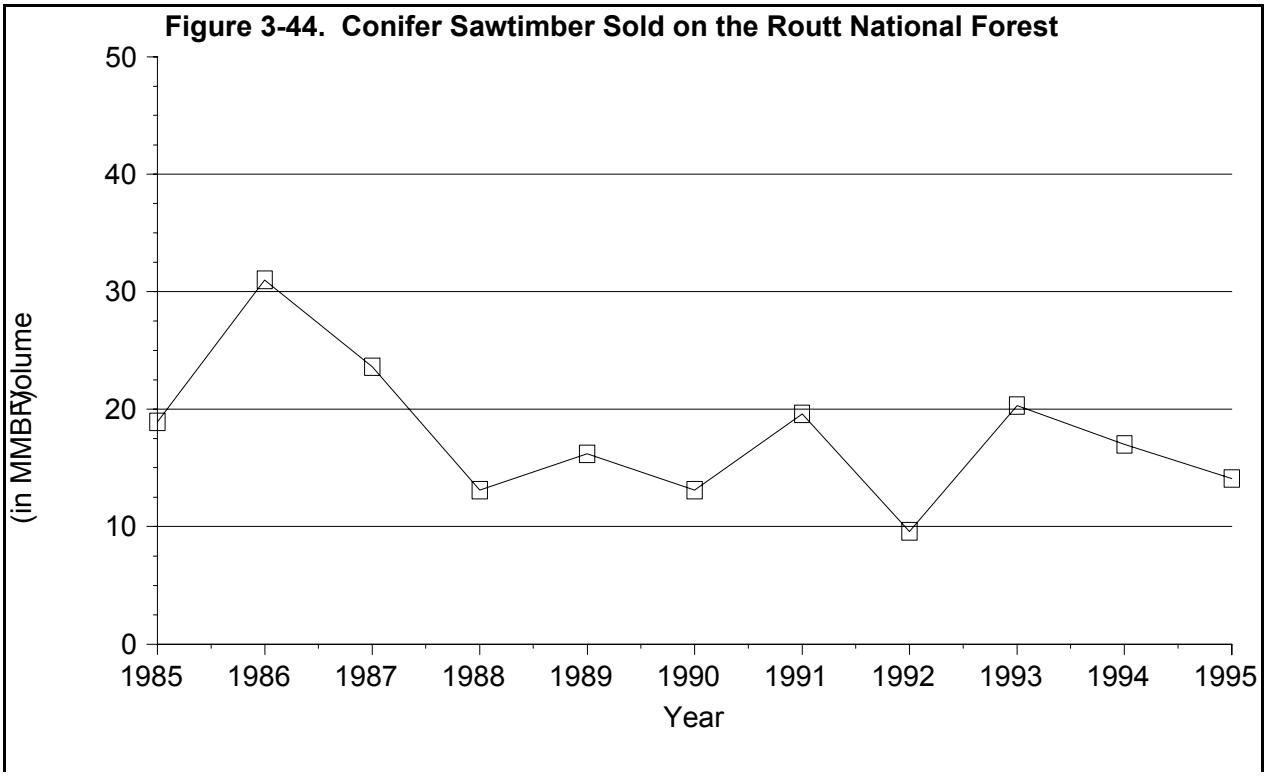
The National Forest Management Act (NFMA) of 1976 (16 U.S.C. 472a) sets forth the requirements for Land and Resource Management Plans for the National Forest System. The regulations on land and resource management planning (36 CFR 219) requires the identification of areas suitable and available for timber harvest and the allowable sale quantity (ASQ) from those lands. In addition, the regulations require the analysis of the supply and demand situation for resource commodities.

Key Indicators

- Timber demand level.
- Suitable acres by management area prescription.
- ASQ and volume offer.
- ASQ from roadless areas.

Figure 3-44 shows the volume sold from 1985 through 1995. These figures are for conifer sawtimber only. The average volume sold during that period was 17.9 million board feet (MMBF).

Figure 3-44. Conifer Sawtimber Sold on the Routt National Forest



Source: Cut and Sold Reports

Table 3-90 displays the acres of harvest activity by silvicultural system that has occurred over the 10-year period from 1985 to 1994.

Table 3-90. Harvest Activity by Silvicultural System

Silvicultural System	Acres
Clearcut	12,450
Shelterwoods	
Preparation cut	5,200
Seed cut	800
Removal cut	2,770
Selection	
Individual	1,280
Group	600
Sanitation/Salvage	4,950
Total	28,050

Source: Rocky Mountain Resource Information System (RMRIS) database, 12/01/94

The acres treated by timber harvest from 1985 to 1994 account for 2.5% of forested lands. The 1983 Plan identified 855,600 acres as tentatively suitable for timber

production. From the tentatively suitable land base, 380,700 acres (28%) of the Forest were determined to be suitable and scheduled for timber harvest.

Timber Supply and Demand

The timber demand assessment for the Forest was derived from a study by Douglas B. Rideout and Jennifer S. Stone requested by the Arapaho-Roosevelt National Forest (Rideout and Stone 1992). The assessment was made for volume that was appraised as sawtimber. Since aspen is not generally appraised as sawtimber, it is not included in the demand assessment. The timbershed identified in this study encompasses the following:

- Routt National Forest.
- Eagle, Holy Cross, and Rifle Districts of the White River National Forest.
- Medicine Bow National Forest, except for the Laramie Peak area of the Douglas District.
- Arapaho-Roosevelt National Forest.

This timbershed will be referred to as the Northern Central Rockies Timbershed.

Most of the purchasers of Routt National Forest timber also purchase timber from the Medicine Bow, White River, and to a minor extent, the Arapaho-Roosevelt National Forests. The supply and demand from the Routt National Forest can not be assessed without taking into account the supply and demand from the other forests in the timbershed.

In developing the demand for sawtimber, Doug Rideout interviewed the major purchasers in the timbershed and determined the volume level that each timber mill was designed to comfortably process annually. This volume level is lower than mill capacity. After determining the volume levels demanded by major processors, with an additional 10% for smaller operators, the timbershed demand level was estimated to be 70-75 MMBF. This estimate includes a decrease of 4.7 MMBF for substitute supplies and a decrease of 6.5 MMBF for the closure of the Kremmling mill.

Since this study, the timber sawmill in Walden has closed. Rideout's study identified this sawmill as producing 16 MMBF annually on a single shift and 22 MMBF with a spike shift. The closing has increased demand at the mill in Saratoga. It is estimated that overall demand has decreased by 7 MMBF, resulting in a timbershed demand level of 65.5 MMBF.

Between 1987 and 1991, the Forest supplied 35% of the 49.7 MMBF of sawtimber in the timbershed (Figure 3-45). In 1991, the Forest supplied 42% of 38.6 MMBF (Figure 3-46). If trends continue, it would be likely for the Forest to supply 45% of the sawtimber in 1995. To estimate the demand for sawtimber from the Forest, the percent supplied to the timbershed was multiplied by the amount demanded (0.45 X 65.5 MMBF), to derive a final demand estimate of 29.5 MMBF.

Figure 3-45. Percentage of Sawtimber Supplied by Each Forest in the Timbershed (Five Year Annual Average 1987-1991)

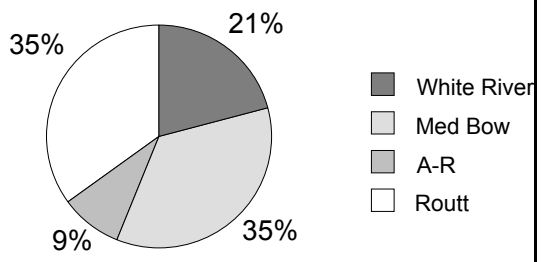
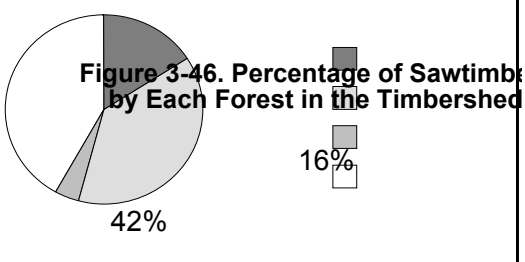


Figure 3-46. Percentage of Sawtimb by Each Forest in the Timbershed



It should be noted that the demand level from the Routt National Forest is dependent on the supply provided by the Medicine Bow, White River, and Arapaho-Roosevelt National Forests. If supply decreases on any of the other forests, without an offsetting increase in supply from another forest, demand for sawtimber from the Routt National Forest would increase. Without increased supplies of timber from the other Forests, it is likely for the demand for sawtimber from the Routt National Forest to be at 35-40 MMBF (or 55-60% of sawtimber in the timbershed).

Figure 3-44 shows the amount of timber sold on the Forest from 1985 to 1995. This figure indicates that the Forest has consistently sold timber below the demand level.

Timber prices nationally have increased dramatically over the past several years. The demand for sawtimber comes from the demand for lumber, and the demand for lumber is closely related to lumber prices. Higher lumber prices signal increased demand for lumber and sawtimber. Figure 3-47 illustrates the increase in lumber prices as reported in the Western Wood Products Association Inland White Wood Index.

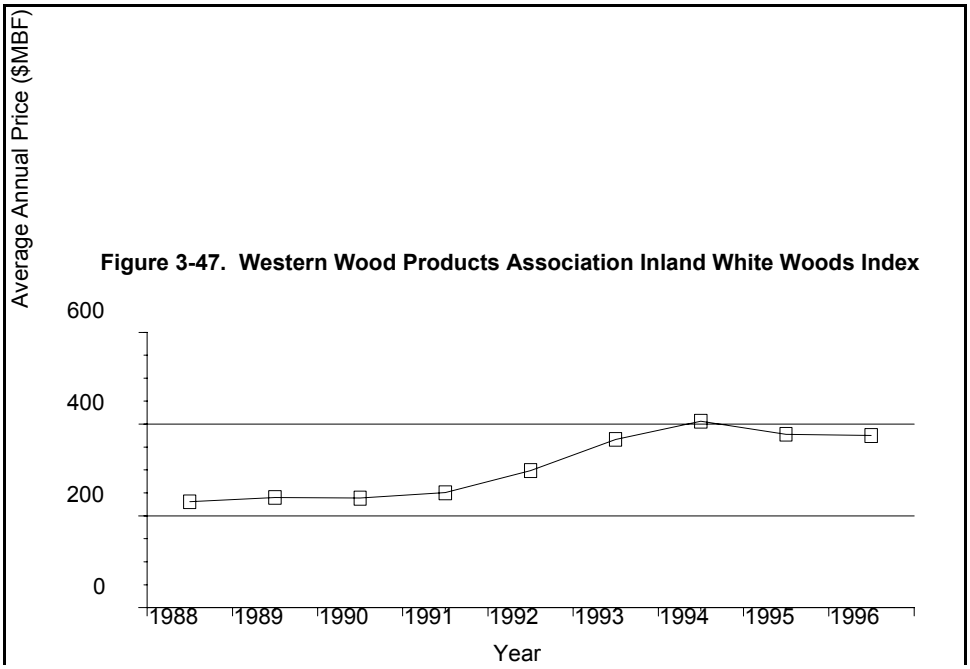
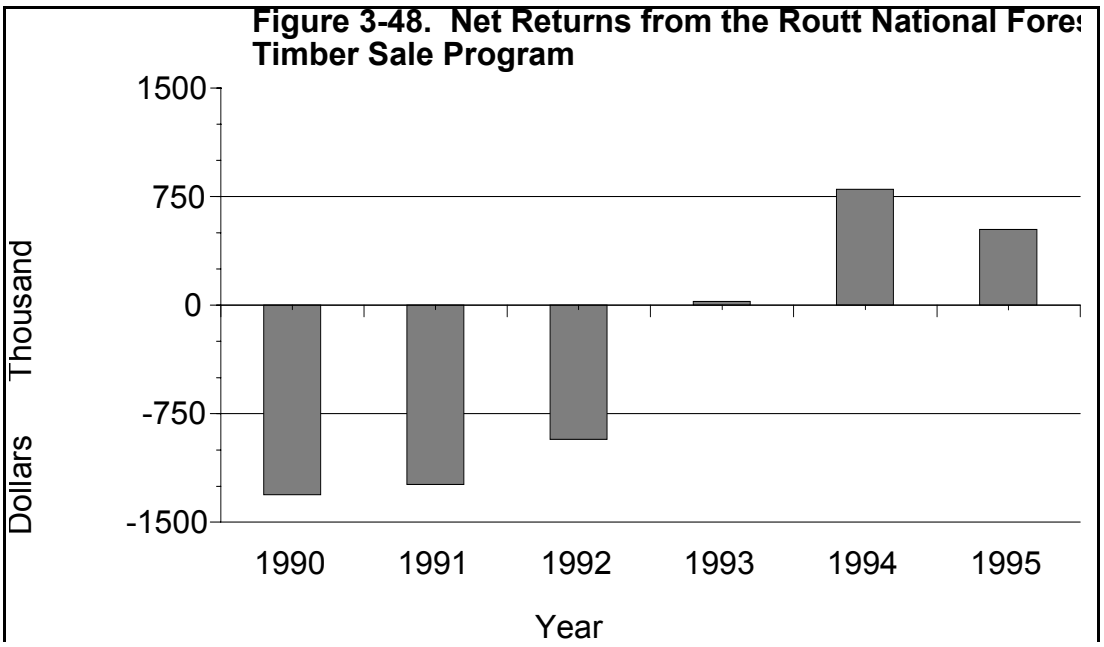


Figure 3-47. Western Wood Products Association Inland White Woods Index

Below-Cost Timber Sales

The financial efficiency of Forest Service timber sale programs is a local and national public issue. According to the Timber Sale Program Information and Reporting System (TSPIRS), the Forest was below-cost for fiscal years 1990-1992 and above cost for fiscal years 1993-1995 (see Figure 3-48). Because timber prices are remaining at a high level, the Forest is expected to remain above cost in the future.



Source: TSPIRS Report 1

Environmental Consequences

General Effects

Timber suitability was analyzed for the Revised Plan. This analysis determined a tentatively suitable land base of 846,300 acres, or 63% of the Forest. Of the 846,300 tentatively suitable acres, 230,600 (27%) are aspen. Thus, 615,700 acres are tentatively suitable conifer. An additional 91,700 acres were found to be unsuitable for all alternatives due to management that precludes timber production or inoperable areas. This gives a tentatively suitable base common to all alternatives of 754,600 acres, of which 213,000 acres are aspen. Figure 3-49 shows the distribution of conifer on the

Forest that is tentatively suitable and common to all alternatives. A discussion of the process used to determine suitability can be found in Appendix B.

Table 3-92 displays the standing volume and Table 3-91 displays the growth of timber from lands tentatively suitable for timber harvest on the Forest.

Table 3-91. Annual Growth for Tentatively Suitable Lands

Species	Million Cubic Feet	Million Board Feet
Spruce/fir	4.61	23.37
Lodgepole Pine	5.53	26.48
Aspen	1.88	4.27
Total	12.02	54.12

Estimated from strata averages of Stage 2 inventory data calculated with the FVS (Forest Vegetation Simulation) program, as Periodic Annual Increment (PAI) Merchantable volumes from the FVS Average Summary Statistics by cycle tables, and based on the following minimum merchantability specifications: aspen cubic feet = 5.0" DBH to 4.0" Top DIB, aspen board feet = 5.0" DBH to 4.0" Top DIB, lodgepole cubic feet = 7.0" DBH to 6.0" top DIB, lodgepole board feet = 7.0" DBH to a 6.0" top DIB, other conifers cubic feet = 8.0" DBH to a 6.0" top DIB, other conifers board feet = 8.0" DBH to a 6.0" top DIB. Values calculated are based on cycles immediately preceding, during, or immediately after the Forest 10 year planning period, (1995-2005).

Table 3-92. Standing Net Merchantable Volume-Tentatively Suitable Lands for Timber Harvest

Species	Million Cubic Feet	Million Board Feet
Spruce/fir	479	2,198
Lodgepole Pine	558	2,510
Aspen	185	345
Total	1,222	5,053

Estimated from strata averages of Stage 2 inventory data calculated with the FVS (Forest Vegetation Simulation) program, as Merchantable volumes from the FVS Average Summary Statistics by cycle tables, and based on the following minimum merchantability specifications: aspen cubic feet = 5.0" DBH to 4.0" Top DIB, aspen board feet = 5.0" DBH to 4.0" Top DIB, lodgepole cubic feet = 7.0" DBH to 6.0" top DIB, lodgepole board feet = 7.0" DBH to a 6.0" top DIB, other conifers cubic feet = 8.0" DBH to a 6.0" top DIB, other conifers board feet = 8.0" DBH to a 6.0" top DIB.

The ASQ for each alternative was formulated by considering the tentatively suitable timber land base, other multiple-use objectives, and the management requirements in the NFMA regulations. The ASQ is only constrained by budget in Alternative C. In order to reflect a more realistic or attainable ASQ, the ASQ for Alternative C was calculated using a budget constraint of 30% above current budget levels. In addition, to display the effect of current budget levels, sawtimber volume offer is calculated for each alternative using a Forest budget that is constrained to experienced levels. A discussion of the analysis process and use of budget constraints can be found in Appendix B.

As standards and guidelines are implemented on the ground, harvest volumes may be limited based on site-specific analysis. Examples are water quality guidelines or wildlife and heritage resources protection measures. Where possible, the effect of these standards and guidelines have been taken into account in the calculation of the ASQ. However, the ASQ is considered a ceiling, and certain conditions may arise where standards and guidelines may limit what volume is actually available.

The only management area prescriptions that are suitable for timber harvest to meet timber goals and contribute towards the ASQ are 5.11, 5.13, and 5.21. Timber harvest may be allowed in other management area prescriptions, but only to meet other resource objectives. Harvest in these areas would not contribute towards the ASQ but would contribute towards the total timber sale program level.

The effects on sawtimber production are directly related to the amount of acres classified as suitable for timber harvest and acres within management area prescriptions 5.11, 5.13, and 5.21 in each alternative. Management area prescriptions 5.13 and 5.21 have a more intensive timber management emphasis and an increased level of timber production at a lower cost. Management area prescription 5.11 has a less intensive timber management emphasis, applying more uneven-aged management and resulting in lower levels of timber production at higher costs.

Timber products other than live sawtimber (posts, poles, firewood, etc.) and salvage of dead timber can be harvested from both the suitable and unsuitable land base. These products do not contribute towards the ASQ. The volume in these products does contribute towards the total timber sale program level. Table S-2 (directly following Chapter 2) displays the volume that is not chargeable to the ASQ and the total timber sale program level for each alternative. The amount of products was estimated based on historic trends and is relative to the ASQ level for each alternative.

Direct and Indirect Effects

Table 3-93 displays the acres of suitable scheduled and unscheduled timber lands by management area prescription for each alternative. Alternatives A, E, and G have the largest acreage of suitable timber, with Alternative E having the largest portion in management area prescription 5.13. Alternative F has the lowest amount of acres that are suitable for timber production and has no acres allocated to management area prescription 5.13.

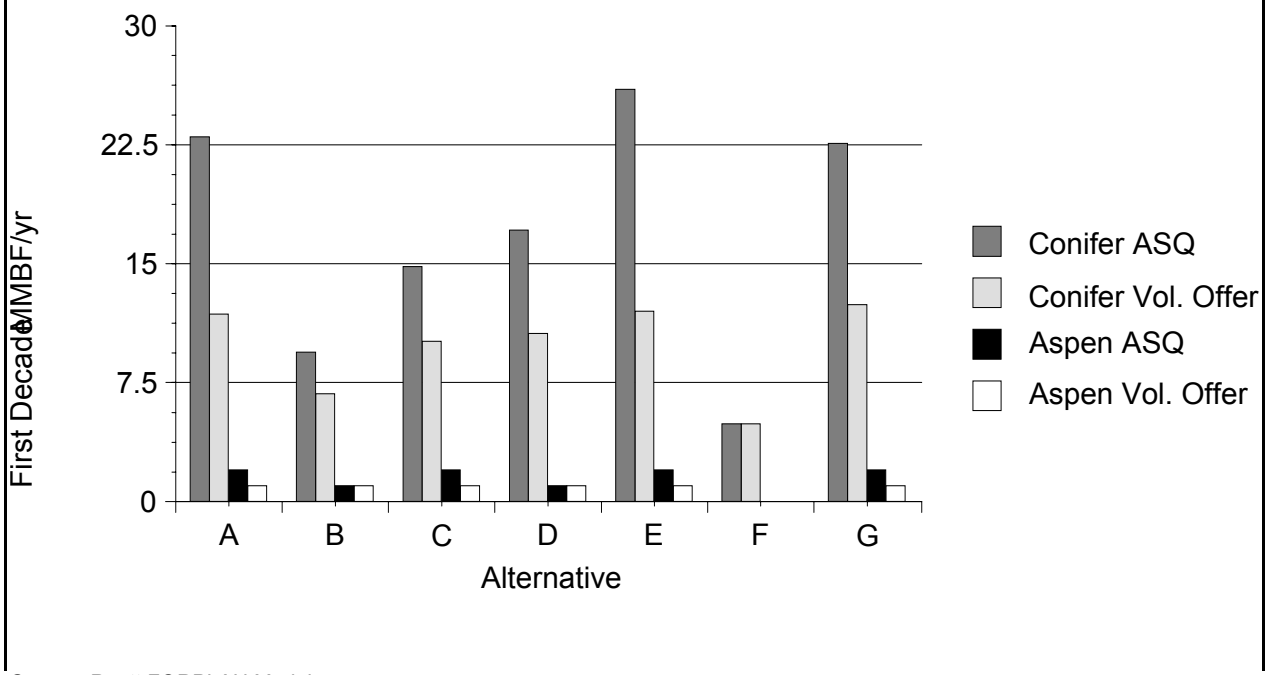
Table 3-93. Acres Suitable by Management Area Prescription

	Acres Suitable for Timber				
Alternative	**Mgt Rx 5.11**	**Mgt. Rx 5.13**	**Mgt. Rx 5.21**	**Total**	**% of Forest**
A	187,383	189,462	44,490	421,335	31
B	244,397	0	0	244,397	18
C	197,408	160,413	0	357,821	26
D	111,292	184,717	0	296,009	22
E	174,673	246,335	0	421,008	31
F	154,493	0	0	154,493	11
G	196,547	222,185	0	418,732	31

Source: FORPLAN analysis area codes

Figure 3-50 displays the amount of conifer sawtimber volume offered and the ASQ (conifer only) for each alternative. ASQ is for the full implementation level, while volume offered is at the experienced budget level. For conifer sawtimber, Alternative E provides the highest ASQ, while Alternative G provides the highest volume offer. Alternative F has the lowest level of conifer timber production.

Figure 3-50. Conifer Sawtimber ASQ and Volume Offer by Alternative



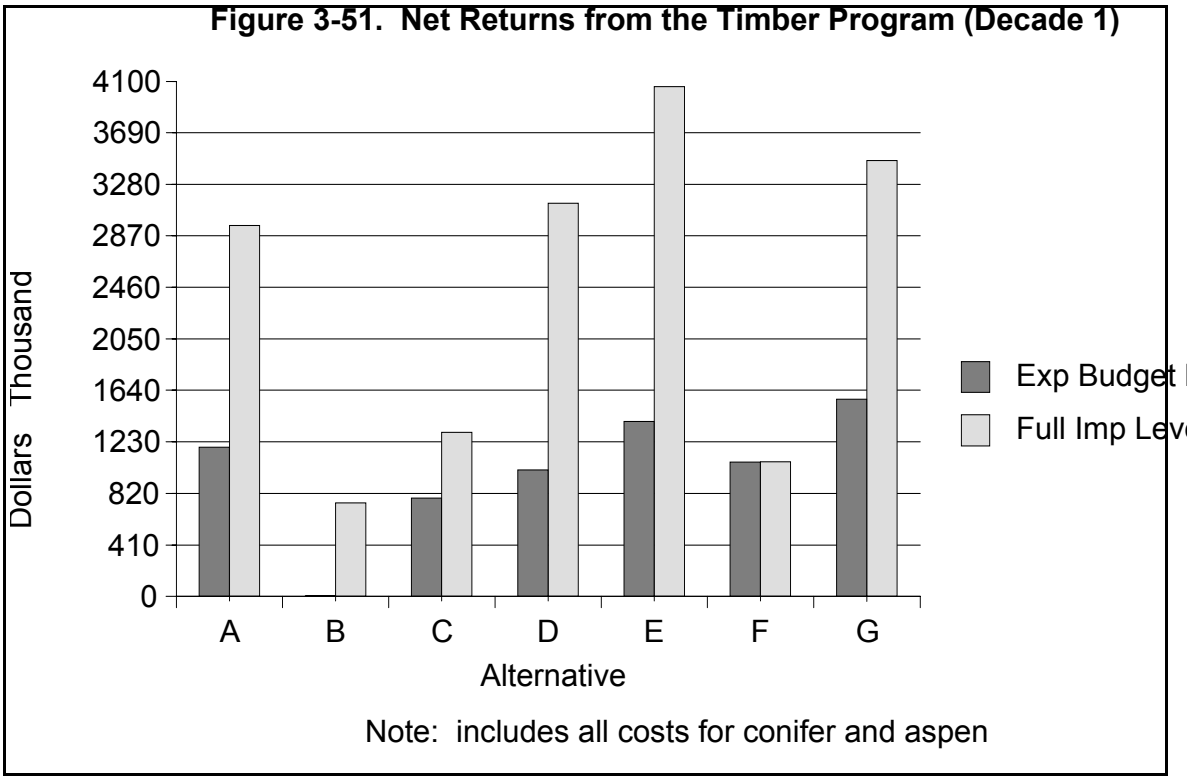
Source: Routt FORPLAN Model

Figure 3-50 also displays the amount of aspen volume offered. Because of the unstable market for aspen, it is a separate, noninterchangeable component of the ASQ and is tracked separately from conifer sawtimber. Alternatives A, C, E, and G provide for 2 MMBF aspen per year in the first decade at the full implementation level and 1 MMBF per year at the experienced budget level. Alternatives B and D provide for 1 MMBF aspen per year under both budget levels. No aspen is harvested for timber management under Alternative F.

All alternatives supply sawtimber at levels that are lower than demand. This indicates there is a structural problem in the timbershed, with industry demand exceeding the timbershed sale level. If sale levels do not meet the demand level, industry will eventually decrease production to bring the demand level back in line with supply. This production decrease typically comes in the form of mill closures (which has already occurred in Kremmling and in Walden) or in mill restructuring to reduced volumes.

Alternatives E, A, and G would provide for the highest level of stability for the existing timber industry in the timbershed. However, with supplies below the demand level, there will be changes to the timber industry within the timbershed.

No alternative has a commercial timber program that is below-cost in any decade. The commercial and noncommercial timber program is above cost in all alternatives for at least the first five decades. Figure 3-51 displays the net returns for decade 1 by alternative. Calculations are based on the last 4 years average return to the Treasury, which is currently $153.16/MBF for conifer. Alternatives A, D, E, and G have the highest net returns.



Source: FORPLAN

Effects from Roadless Areas - The amount of roadless areas that are allocated to management area prescriptions that generate the ASQ (5.11, 5.13, and 5.21) varies by alternative. Table 3-94 lists the total suitable acres allocated to 5.11, 5.13, or 5.21 that are within roadless areas. The table also shows the change in ASQ level for each alternative if these roadless areas were unavailable for harvest.

Table 3-94. Acres Suitable by Management Area Prescription

Alternative	Acres Suitable for Timber Production	Conifer ASQ from Roadless Area Decade 1 (MMBF/YR)	Conifer ASQ from Roadless Area Decade 5 (MMBF/YR)
A	111,635	7.3	4.9
B	2,308	0.0	0.0
C	59,287	0.4	0.1
D	25,278	1.2	0.7
E	123,078	7.5	7.8
F	1,822	0.0	0.0
G	125,820	6.0	5.3

Source: Routt FORPLAN Model

Alternatives A, E, and G have the largest amount of roadless areas allocated to management area prescriptions 5.11, 5.13, or 5.21. Because of the availability of roadless areas to timber management, these alternatives also have the highest ASQ and volume offer levels. Alternatives B, D, and F have very little timber production on roadless areas, with most roadless areas allocated to a nontimber management area prescription.

The effect on ASQ from roadless areas is highest in Alternatives A, E, and G. For those roadless areas that were allocated to timber management under alternative C, the effect

on ASQ is very small. Under the experienced budget level in all alternatives, no timber is harvested from roadless areas.

Effects from Fire Management - Under Alternatives B and F, natural processes are emphasized and there is increased potential for wildfire. This could result in fire damaging or killing trees on very limited acres or across many acres, depending largely on climatic conditions. Because of the large areas that would not be actively managed, it would be difficult to prevent or suppress fires within the areas managed for timber (Management Area Prescription 5.11). The increased potential for wildfire could decrease, or through salvage operations, momentarily increase the amount of timber that could be harvested under these alternatives.

Under Alternatives A, C, D, E, and G, there is a lower potential for wildfire through active management. Compared to Alternatives B and F, there is a greater possibility of preventing or suppressing fires in areas where timber is being managed (management area prescriptions 5.11, 5.13, and 5.21). This would result in a greater possibility of stable timber supplies.

Effects from Insect and Disease Management - Insects and disease can affect the production of timber by killing and damaging trees. Under all alternatives, there exists potential for salvage/sanitation cuts to harvest dead and damaged timber and to attempt to slow or impede infestations from spreading. The degree to which these harvests are undertaken will largely depend upon the risks associated with wildfire potential, infestation spread into healthy stands, public safety, the presence of high value resources, and the resource emphasis of the infected or adjoining area.

Under Alternatives B and F, where natural processes are emphasized, there is a greater potential for infestations from insects and disease. As with wildfire, there is the possibility of killing vast acreages of timber. A large infestation could momentarily increase timber supplies, through salvage sales, with a future decrease in supply.

Cumulative Effects

No alternative meets the current timbershed demand level. Alternative E is close to meeting it, but is still below the timbershed demand level. If the volume sold and ASQ levels from the Arapaho-Roosevelt, Medicine Bow, and White River National Forests decrease from current levels, the supply level in the timbershed would further decrease. This additional decrease in supply would put increased pressure on timber industry to lower the demand level to equal supply. This will result in higher timber bid prices for stumpage within the timbershed as competition increases. The timber supply from BLM, state, or private lands may increase, but not significantly. Eventually, timber industry will downsize through mill closures or decreased production levels until the demand level equals the timbershed's supply.

If supply levels within the timbershed increased sufficient to meet the demand level, timber industry would stabilize and, with reduced competition, timber bid prices within the timbershed would probably decrease.

Social and Economic

- Social
- Economic

Social Environment

Introduction

Social analysis is conducted by the Forest Service to determine what effect the agency's land management programs have on local communities and the people using the natural resources. People using the forest are part of the ecosystem and are considered in management decisions.

Rural areas surrounding forests are often dependent upon forest resources for much of their social and economic well-being. This dependency can affect the life-styles, population, and quality of life of the area. Public issues and demands surrounding the development of a forest plan relate to interest groups within the human environment. A forest plan has potential to impact the local economy, life-styles, community stability/cohesion, and cultural values. Tensions in the local social-political environment can become heightened as timber, range, or other multiple-use groups want to have decisions made in their interests, while environmental groups also want their interests protected and possibly expanded. Consequently, forest management is of great concern to all interest groups in the area. These groups include, and are not limited to, counties and associated state agencies, community organizations, recreation groups, forest-dependent industries, environmental groups, permittees, and Native Americans.

Legal and Administrative Framework

NEPA requires integrated use of the natural and the social sciences in all planning and decisionmaking that affect the human environment. The human environment includes the natural and physical environment and the relationship of people to that environment (40 CFR 1508.14). Forest Service land management planning regulations require the integration of social science knowledge into the forest and regional planning process (36 CFR 219.5).

Key Indicators

- Change in population.
- Change in life-style.

Affected Environment

Zone of Influence

Although individuals and communities over a wide geographic area use forest resources, it is the residents and businesses of counties near the Forest who depend most heavily on the availability of the resources. Consequently, the effect of the Forest's resources on social and economic factors is strongest within these areas. For this reason, the Forest primary zone of influence is defined as Grand, Jackson, Moffat, and Routt Counties in Colorado and Albany and Carbon Counties in Wyoming. The social impacts of forest management in Garfield County are related to forest activities on the White River National Forest, including the Aspen Ski Area. Rio Blanco County is also influenced socially outside of the Routt National Forest. The life-style and economic changes in Garfield and Rio Blanco Counties will not be described in this EIS.

The social environment is described by communities; the economic environment by counties. The communities described are: Walden, Kremmling, Craig, Steamboat Springs, Yampa, and Oak Creek, Colorado and Laramie, Saratoga, and Encampment, Wyoming. Many different life-styles exist within the primary zone of influence. However, they have one thing in common; their life-styles are linked in multiple ways to the land and natural resources.

Changes in the West

Rural communities in the western United States are confronted with change and challenge. There is a "migration turnaround" that reflects a reversal of the rural-to-urban migration that characterized much of the United States prior to the 1970s. Many rural areas are experiencing a significant increase in population after decades of stability or decline. In the scenic areas, particularly those with recreation opportunities, ranches are being sold and used for recreation purposes or subdivided for homesites.

Other rural areas continue to lose population. This is due, in part, to the out-migration of young people. In addition to these trends, some rural areas have been through population and employment "boom and bust" cycles associated with mineral development.

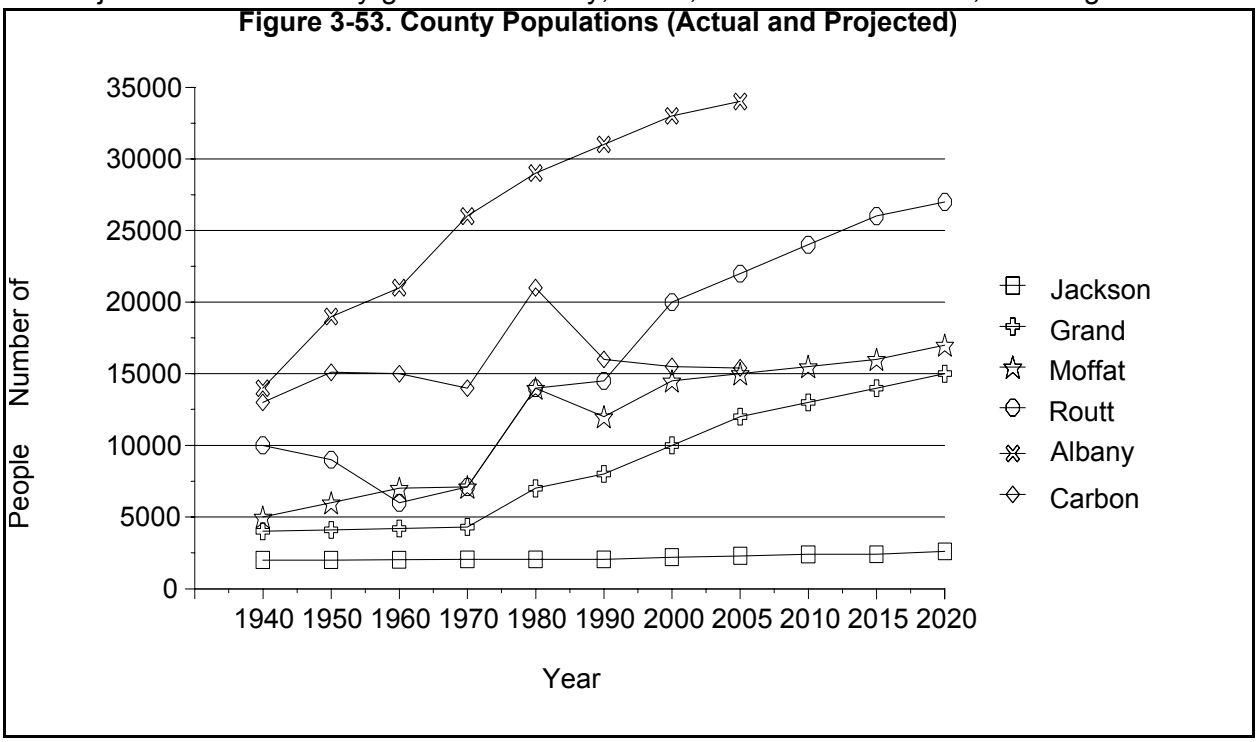
For about the past 20 years, economies in rural areas have been changing from a long-term dependence on agriculture, and in some cases mining, to a high degree of dependence on recreation and tourism. The character of these communities is threatened by suburbanization, resort development, and those seeking rural life-styles for their families. Communities losing population are having difficulty maintaining their local businesses and services, such as schools and health care.

Affected Population

Figure 3-53 displays the change in county population between 1940 and 1990 and population projections for the years 2000 to 2020. Grand and Routt Counties have increased in population, primarily due to ski area development. While the population increased in Grand County, the town of Kremmling decreased in population by 9.1% between 1980 and 1990. Between 1980 and 1990, population in Jackson County decreased 13.8%, from 1,863 to 1,605. Despite boom and bust cycles between 1970 and 1990, the population of Moffat County has increased due to energy production, which includes a power plant and coal mining. Population in Routt County increased 5.1% between 1980 and 1990, from 13,404 to 14,088. Oak Creek, Yampa, and Hayden decreased in population between 1980 and 1990. Oak Creek decreased 27.6%, according to the 1990 Census. However, populations are likely to increase as a result of the increasing cost of living in Steamboat Springs.

Projections show steady growth in Albany, Routt, and Moffat Counties; slower growth in

Figure 3-53. County Populations (Actual and Projected)



Grand County; and a slow decline in Jackson and Carbon Counties.

Housing

Changes in the structure of the community, with growth or decline, affect the social structure. Increasing use of the area and population growth in Routt County has brought a substantial increase in the number of new housing units, particularly short-term leasing units. Demand for affordable housing will continue to rise with the increase in service jobs. In spring 1992, the City of Steamboat Springs conducted an extensive survey to determine priority needs in the community. The number one concern identified was the need for affordable housing.

Table 3-95. Median Housing Values (1990 dollars)	
County/Community	**Average Housing Value**
Albany	$ 67,300
Laramie	$ 66,500
Carbon	$ 52,700
Saratoga	$ 53,500
Grand	$ 81,400
Kremmling	$ 58,500
Jackson	$ 49,800
Walden	$ 47,100
Moffat	$ 52,900
Craig	$ 52,600
Routt	$ 94,900
Hayden	$ 53,400
Oak Creek	$ 39,800
Steamboat Springs	$119,700

Source: 1990 Census

The cost of housing is substantially higher within the City of Steamboat Springs compared to other towns in the zone of influence. Table 3-95 shows median housing values for communities near the Routt National Forest (1990 Census figures).

Since the 1990 Census was published, housing costs have risen dramatically in some of the above counties. According to Routt County Assessor's office, median housing values in Steamboat Springs were $150,000 in 1992; $170,000 in 1993; and $256,000 in 1994. Housing prices have also increased significantly in other communities, including Kremmling and Hayden. Many people are commuting to work in Steamboat Springs from as far as Craig, (40 miles one way). People are also commuting from Kremmling to Silverthorne, (38 miles one way).

American Indians

American Indians have distinct cultures and traditional values. They have a unique legal and political relationship with the United States Government, which is defined by history, treaties, statutes, court decisions, and the U. S. Constitution.

Land and resources hold important meanings in the spiritual and everyday lives of American Indians. National Forest System lands contain many traditional, historic, and contemporary use areas which are of critical importance to American Indians. Cultural practices, such as gathering of plant resources and practicing spiritual beliefs, occur commonly on National Forest System lands. Throughout the Forest there are places and resources of special concern to American Indians. These merit attention, and sometimes, specific management actions to preserve or enhance unique characteristics. Some are also considered cultural resources or traditional cultural properties.

Areas that are of concern to American Indians should be managed to:

- Prevent inadvertent damage from management activities.
- Integrate their management with overall multiple use management.
- Provide opportunities for use and access by American Indian populations.
- Maintain or increase abundance and diversity of floral species for traditional cultural use.

The Ute Indians occupied areas of Colorado and Utah for the past 300-400 years. The Ute and Arapaho in Grand County fought over Colorado River Valley hunting rights. The Ute referred to North Park, in Jackson County, as "Cow Lodge" and "Bull Pen" because of its geographical contour and the great number of bison which summered there. The Ute lived in North Park during the late spring, summer, and fall seasons. They came to the park following herds of bison, deer, antelope, and other game. Arapaho, Crow, Sioux, and Cheyenne Indians also frequented the area. The Ute lived in the Browns Park area and followed the seasonal rounds of the large game animals.

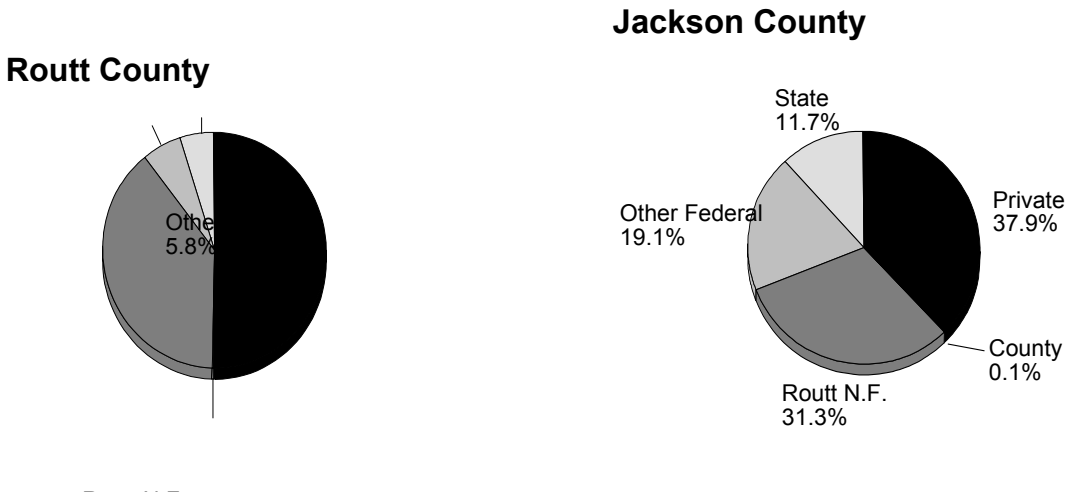
Routt County, with its numerous hot springs, was very important to the Ute people. The waters, with their medicinal qualities, were considered sacred and the area was considered holy. An incredible abundance of game made Routt County a favorite summer hunting ground for many western Indian tribes. When the first settlers arrived, five hundred Ute were camped along the Yampa River, in the area now serving as the Steamboat Springs City Park.

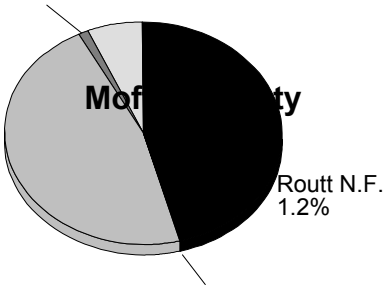
Land Ownership

Many counties in the western United States contain a large amount of federal land and are influenced by management actions on that land. Jackson County is 50.4% federally owned, with an additional 11.7% state ownership. Grand County is 69.2% federally

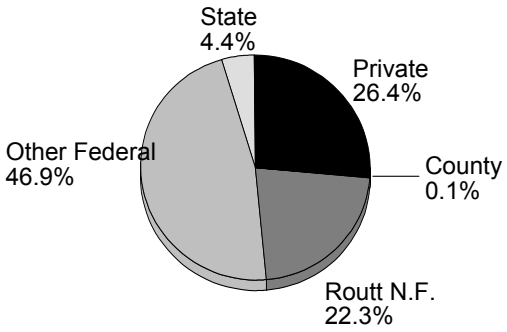
owned, with an additional 4.4% state ownership. Routt County is 45.5% federally owned, with an additional 4.7% state ownership. Routt County contains the most acres of Routt National Forest lands of any county in the zone of influence. Routt National Forest lands make up 39% (577,700 acres) of all land in the county. Figure 3-54 displays land ownership in each county.

Figure 3-54. County Land Ownership

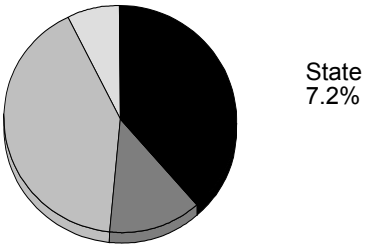




Grand County

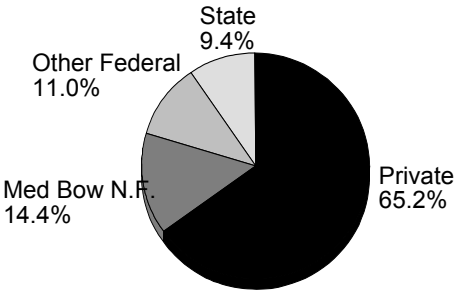


Carbon County



Other Federal

Albany County



Community Profiles

The information that follows for each county on vision, values, newcomers, and trends came from interviews conducted in each community during 1994. The purpose of the interviews was to gain information about the values and life-styles in the zone of influence.

Grand County

During the 1820s, French fur trappers named the valley "Old Park" (now known as Middle Park), and called the great river the "Grand " (now known as the Colorado River). Kremmling's first known white settler arrived in the 1870s. As the area's valleys became known for producing superior hay, ranchers began to settle the area, providing an economic base that survives today. Kremmling's principal growth came between 1904 and 1908, with the arrival of the railroad.

The social analysis of Grand County focuses on Kremmling. The remainder of Grand County is influenced by the Winter Park Ski Area and management activities of the Arapaho/Roosevelt National Forest. In January 1988, High Country Research Associates conducted an economic profile survey for Kremmling. According to this survey, 59% of the population of Kremmling makes less than $25,000 per year. Since that survey was conducted, Louisiana Pacific closed its waferboard plant, which employed over 200 people, nearly 20% of the town's population of 1,200. The community formed an economic development committee and has been very active in pursuing opportunities to diversify their economy. They received a total of $60,000 in rural development grants from the Forest Service in 1992 and 1993 and several grants from other sources.

Kremmling

Values - quality of life, relaxed pace of life, good schools and education, rural setting

Vision - Some would like to see growth to keep the tax base for the schools and perhaps increase the services available. The economic development council assisted the community in identifying its vision, goals, and objectives. The way change is structured in a community is important. Stable industries are needed as part of the main economic base.

Newcomers - Some newcomers are changing the local customs as they bring their own values into the community. Some have moved to Kremmling to get away from the fast pace of life. Many newcomers have different attitudes and values. They work out of town and do their business out of town.

Trends - Although the population had decreased by 1995, Colorado demographers estimate the population to increase 45% by 2020. Kremmling is already growing; it is becoming a bedroom community for Summit County. In many of these homes, one person in the family may work in Kremmling and one may commute. Kremmling is becoming a stronger, more stable community.

There is a housing shortage, and prices have increased since 1993. Currently there are no rentals and few homes for sale. Wealthy nonresidents are buying ranches. The land is utilized as a ranch, but many have absentee owners.

Jackson County

The first white settlers to visit and explore the valley were fur trappers, and they named the area "New Park". After the trappers and hunters arrived, miners and prospectors followed. More miners came to North Park and loggers began to establish themselves in the northern part of the park. Trees for railroad ties were cut during the winter months and piled along the river banks. When the ice melted in the spring, the ties were pushed into the river and floated north to their destination.

Natural pastureland, protected on all sides by mountains, provided excellent ranching opportunities. The first cows were wintered in 1878, resulting in the establishment of several permanent ranches which remain part of the ranching community today. Commercial logging became common in the 1930s and remains an important part of the county's economic base. By 1890, Walden was established. It later became the seat of Jackson County.

From 1909 through 1950, Jackson County steadily increased in population. However, there has been a slow, steady decline in population from 1950 to 1990. Walden recently formed a rural revitalization committee and, in the past four years, has received Forest Service grants totaling $84,000. Culturally, the county is more similar to that of southern Wyoming areas like Saratoga and Encampment than other bordering Colorado areas along the Front Range.

Walden

Values - Unspoiled way of life, supportive people, low crime rates, freedom of choice.

Vision - Some feel people are coming to the county because of its values, and growth will bring tremendous changes to the area. Others feel the threat of poverty to the area, with declining populations and lack of services.

Newcomers - Generally, they are trying to become part of the community.

Trends - Many ranches have absentee owners and do not have commitments to the community. There is pressure to sell out, with offers made to ranchers from persons out of state. More people are living in town, fewer on ranches. Land sold to the federal government takes away from the tax base, such as the National Wildlife Refuge sold in the early 1970s. There is an increase in recreation, hunting, fishing, snowmobiling, etc.

Moffat County

In 1838, there were plans for a fort and trading post in an area that later became known as "Browns Park." Many were attracted to the area with the hope of finding gold. The first settlers came from the north on the Overland Trail. Around the turn of the century, Browns Park was the center of the range wars which pitted cattlemen against sheep herders. The oil boom of the 1920s made the town of Craig the largest community in northwest Colorado.

Mining and agriculture have historically defined the character and lifestyle of the county. The power plant and coal mine near Craig have provided the opportunity for ranchers to supplement their living or for family members to stay in the area. Often in ranching communities, family members are forced to move in order to make a living. The county

government has expressed the importance of protecting the customs and culture of Moffat County, which includes agricultural production, timber, industries and manufacturing, and mineral production.

There has been a population pattern of boom and bust due to energy production. Population was 6,525 in 1970, doubled between 1970 and 1980 to 13,133, and decreased by 13% to 11,357 in 1990. Only 1.2% of Moffat County is Routt National Forest lands. Ranchers, loggers, hunters, outfitter/guides, and other recreationists use the Forest and contribute significantly to the character of eastern Moffat County.

Craig

Values - Small community, serenity, good facilities and schools

Vision - Craig may be facing growth. It is becoming a bedroom community for Steamboat Springs. The expectation is that this trend will decrease its dependence on energy resources and move it away from the boom and bust cycle characteristic of communities dependent on one major industry.

Newcomers - Most are trying to fit in the community. Many people have moved to Craig within the past 5 years, including retirees.

Trends - Economy is moving towards recreation due, in part, to the Yampa River projects and the proximity to Dinosaur National Park. There will be less dependency on mining and the power plant.

Routt County

White settlers came to the area as trappers. Fur trapping gave way to farming, ranching, and eventually mining. Skiing has been a part of Steamboat Springs since just after the turn of the century. The Howelsen Hill Ski Area is the oldest (1915), largest, and most complete ski jumping complex in North America. Routt County began as an agricultural area and still maintains many sheep and cattle ranches, in addition to growing hay, wheat, oats, and barley. Approximately 47% of land in Routt County is publicly owned, the majority by the Forest Service.

Within Routt County are four incorporated municipalities: the City of Steamboat Springs (pop. 6,695), Hayden (pop. 1,444), Yampa (pop. 317), and Oak Creek (pop. 673). Hayden is a stable, small mining and ranching community, with many long-time residents. However, new people are moving in and commuting to Steamboat Springs to work. Yampa is a close-knit ranching and mining community. Many families have been in the area for generations, do not like the change happening in their community, and fear that the people moving in bring different values. Oak Creek was a mining town until the early 1980s when lay-offs occurred. Tourism in Oak Creek is increasing, partially due to its proximity to Stagecoach Reservoir. Hayden, Yampa, and Oak Creek are all bedroom communities for Steamboat Springs, and housing and land prices are increasing as a result.

Routt County's social context has changed considerably. This is due largely to a transition from long-term patterns of economic dependence on agriculture and mining to a high degree of dependence on recreation and tourism, especially downhill skiing. This transition has been accompanied by sustained, and at times fairly rapid, population growth. Much of the growth has been concentrated in the Steamboat Springs area. Accompanying such changes have been shifts in established social structures and life-styles, including some reduction in the high degree of interpersonal familiarity and

informality that tend to be evident in relatively rural small-town setting (Freudenburg 1986).

A quality of life, lifestyle, attitudes, beliefs, and values study was conducted for the Steamboat Springs area in 1987 (RRC Associates 1987). Friendly atmosphere, country living, and the climate were often listed by residents as major factors behind their decision to live in Steamboat Springs and the surrounding area. However, community residents did have concerns. The most significant concerns were related to the economic health of the community, particularly the cost of living, job opportunities, and low wages. Other problems identified included traffic congestion and the number of tourists. Currently there is widespread concern that growth has caused the sense of community to deteriorate, due to reduced familiarity among residents, the increased presence of residents who do not have long-term ties to the community, and the large numbers of seasonal visitors.

In 1990, Richard Krannich conducted a socio-cultural assessment in Routt County. The study produced findings similar to the 1987 study, regarding satisfaction for quality of life. The study noted a high degree of importance associated with maintaining the ranching and agricultural heritage of the area. Another issue receiving a very high importance rating was improving local planning efforts to ensure that growth is manageable and sustainable. The third issue receiving a high importance rating was the preservation of existing values and life-styles.

South Routt Oak Creek and Yampa

Values - Lifestyle, small town friendliness, access to outdoor recreation, lack of crime, lack of crowding, quiet surroundings.

Vision - Towns will keep growing. Lake Catamount development will have impacts on the area. Some see a vision they do not like, one with more and more changes.

Newcomers - For the most part, newcomers are fitting into the communities and becoming a part of the communities, with exceptions of second homeowners and seasonal ski-resort workers.

Trends - Increasing amounts of land are being subdivided and sold due to promotion of the area. There is a shortage of housing available for sale and rent. There is more pressure to sell agricultural properties. Local ranchers get frequent inquiries to sell, however some ranches have been in the family for years.

Steamboat Springs

Values - Friendliness, cleanliness, surrounding environment

Vision - The community needs to look diversifying its economy to avoid becoming another Aspen. Steamboat Springs will continue to grow, with or without the Lake Catamount development. Housing and land prices will continue to rise.

Newcomers - Some are getting very involved in the community. There are many influences in Steamboat Springs.

Trends - There are many single-family homes and condos bought by second homeowners. Affordable housing is becoming more of an issue for the seasonal worker, as well as the middle-income family. The community is developing a comprehensive land-use plan to direct growth and preserve open space. Ranches and landowners are subdividing for development of condos and single-family homes.

Albany County

One of many communities on the railroad, Laramie was given the University of Wyoming as part of the state's process for dividing state governmental entities. Through the year, the population is seasonal. Students at the university are residents from September through May.

Laramie

Values - Recreation, education, quality of life, ranching along the Laramie River

Vision - The community will continue to grow and remain stable because of the university influence.

Newcomers - Persons attending the university move to Laramie for their education.

Trends - The university provides a base for high technology industries looking to relocate to rural America. There is a trend toward more home-based businesses utilizing the access afforded by computers and modems.

Carbon County

Carbon County is a sparsely populated rural area. In 1993, the Forest Service funded a rural development grant of $50,000 for an economy diversification study. The Carbon County Coalition, formed in January 1992, has a mission to create greater awareness and understanding concerning the economical and ecological conditions of Carbon County.

There is a strong sense of community identity and loyalty to those who live in and/or own businesses in Saratoga and Encampment.

Saratoga increased 51% in population from 1970 to 1980 and then decreased 24.7% in permanent population from 1980 to 1994, although there appears to be unexpected growth in vacation home owners in the area. Encampment followed a similar pattern in the 1980's, after increasing 47% from 1970 to 1980 the population decreased 20% (from 611 to 490) between 1980 and 1990, and has begun to rebound since 1990 with an increase of 9%, or 594 permanent residents.

Saratoga

Values - Small community, open spaces, stability, security, easy-going atmosphere, proximity to the mountains, quality of life

Vision - Some wanted to see community growth include new housing and a means to provide additional jobs, but not boom-and-bust growth. Others are resistant to any change. People could tolerate change if it is compatible with the existing lifestyle in the community.

Newcomers - People that come to the area stay and tend to have similar values. The valley is a very difficult place for people to fit in if they do not accept the community as it is.

Trends - Land is being sold for development, especially ranches with land along the river. Ranchers are facing things they believe would threaten their way of life, such as changes in government grazing requirements and the influx of people.

Saratoga may have a slower growth rate than other areas in the west because of location and transportation access problems encountered in the winter. However, the

area is changing. There are more second homeowners, and some ranches are being subdivided, especially on land near rivers. Absentee ownership is becoming familiar. Ranches sell to nonresidents but are being kept as working ranches.

Encampment

Values - Proximity to the outdoors, no one is in a hurry, small community, safety, good schools, strong community, ranching lifestyle

Vision - There is a mix of opinions. Some think there is room for development, including second homes. Encampment and Riverside will grow due to retired people moving in but not due to industry. Others feel the timber industry has to be maintained to keep the school and local businesses open (enrollment in the school is down). If the Louisiana Pacific mill shuts down, the hardware store, as well as other businesses, may leave the community.

Newcomers - The area is not seeing much growth, but the people moving in seem to adopt the lifestyles of the area. People are leaving the area due to lack of jobs and opportunities.

Trends - The economy of the area is very dependent on natural resources on federal lands. Ranchers and those employed in the timber industry feel threatened by government policies. Property is being sold along the river for development.

Environmental Consequences

Social impacts are changes in social and cultural conditions which directly or indirectly result from changes in the economy, demographic movement, technology, or other factors in the social environment or from actions of agencies such as the Forest Service. Those actions can affect areas including employment opportunities, the diversity and availability of recreation opportunities, or the environmental qualities of the area.

The potential for conflict over use of forest resources arises when expectations of two or more groups differ significantly or alternatives have different effects on various social groups.

The Larger Pattern of Social Change

To characterize the larger picture of social change, it is important to recognize changes and trends occurring outside of Forest Service actions. The United States is presently undergoing a period of major social and demographic changes. The South and West regions of the nation are projected to account for 82% of the 18 million persons added to the nation's population between 1993 and 2000. From 1993 to 2020, the South and West are each expected to increase by nearly 28 million persons. States in these two regions accounted for 84% of growth during the 1980s.

The white population is projected to account for 60% or more of the absolute increase in the nation's population in all regions, except the northeast. American Indians and Eskimos are projected to be the second fastest growing population in the West between 1993 and 2000.

Since the 1950s, tourism and recreation have become a larger part of the employment in many western communities. However, recent advances in telecommunications have created opportunities in many areas. Economic changes typically occur by a slow process of adjustment. People have to form businesses, borrow money, establish, and build markets, etc. Technological change typically occurs much more quickly, and the

greatest impacts of technological change are on local cultures and community cohesion. Many families are moving to rural areas in the West and are able to conduct business by telecommunication from their homes.

Population growth, coupled with economic growth, has changed social patterns, particularly by introducing new values and lifestyles within the zone of influence.

Understanding New Realities

The waferboard mill closing in Kremmling in 1989 is an example of positive community responses to outside circumstances. Nearly 30% of Kremmling's total employment was directly or indirectly associated with the mill. Its closing brought concern that the local economy was crippled beyond recovery. In fact, stores did not close, and people did not leave. At the county and regional level, several trends were apparent. First, much of the county's personal income stemmed from unexpected sources. Although the area's economy had been commonly viewed as timber dependent, it had, for more than a decade, experienced diversification and a gradual reduction of its dependence on traditional resource extraction industries. Also, leadership in the community played a large role in recovery and adapting to change.

General Effects

None of the alternatives are expected to have a substantial effect on the overall population growth within the Forest's area of influence. Based on employment data and population trends, the gradual increase in population projections for the surrounding area should continue at a steady rate. Some of the small communities may continue to experience limited population loss over the long term.

With increasing population and growth in numbers of recreation users of the Forest, there may be carrying capacity studies to determine limits on special-use permits and recreation users.

The Forest Service will continue to provide rural development opportunities in all alternatives. This program provides for economic diversification assistance to local communities that are eligible for such aid under Subtitle G of the 1990 Farm Bill.

The Forest is committed to equal treatment of all individuals and social groups in providing services. All alternatives are expected to provide equal treatment on individual and group civil rights.

Consequences to Special Interest Groups

Motorized vehicle groups including snowmobilers, off-highway-vehicle groups, and multiple-use coalitions would benefit most from Alternatives A, C, E, and G.

The limited human disturbance characteristic of Alternative F would limit the recreation opportunities of people using the Forest, although there would be more opportunity for solitude.

None of the alternatives, except Alternative F, would affect ranchers. In Alternative F, because of the decrease in range opportunities, some area ranchers may lose their permits on the Forest. Whether they would find private land to lease or continue to depend on Forest land for their operations, the degree their lifestyles would change would vary depending on the size of operations and its ability to absorb those kind of changes.

Timber operators in Laramie, Saratoga, Walden, Craig, and Encampment would be affected the most in Alternatives B and F because of decreased timber production.

According to the public open houses held during fall 1993, some persons would be concerned about access limitations resulting from increases in roadless and wilderness areas under Alternatives B, D, and F. Other persons responded they would like to see a decrease in the number of motorized acres to provide better solitude and wildlife experiences.

Consequences to Communities

The communities of Steamboat Springs and Kremmling will continue to grow due to influences outside of the Revised Plan. None of the alternatives would have potential to cause notable social change in those communities. Communities surrounding the Forest such as Yampa, Oak Creek, and Hayden will not be affected by the alternatives, but continue to be influenced by growth in the area.

None of the alternatives would significantly affect the community cohesion or lifestyles in Laramie because of the influence of the University of Wyoming on that community.

The community of Craig may benefit from Alternatives A, E, and G which provide the most opportunities for motorized recreation. Communities (such as Craig) that depend on snowmobiling and other motorized recreation opportunities as part of their tourism base would benefit most from these alternatives.

Many people's lifestyles in Encampment, Saratoga, and Walden are dependent on timber from the Forest. Because Alternatives B and F represent a lower amount of timber production, communities dependent on timber are likely to perceive the economic and social consequences of these alternatives as significantly greater than those forecast for Alternative A, E, or G. People in these communities may perceive this change to have a negative effect on their lifestyle. However, community cohesion may increase because of the close ties of people in smaller communities and the willingness to pull together. The magnitude of effect depends on the ability of those communities to diversify their economies and adapt to other demographic and social changes. With tourism and growth in Saratoga, that community may have more ability to adapt to change than Walden or Encampment because of influences from outside the area.

Immediate consequences with the loss of jobs in some communities would include persons leaving the community and the resulting losses of revenues to schools and other services. The loss of jobs may have the potential to increase problems in families. If job losses come at a time when the community is experiencing economic difficulties, its ability to provide social service expenditures necessary to deal with the increased social problems is reduced.

Many persons in Jackson County believe there should be areas available for multiple-use and Alternatives A, C, D, E, and G would provide those opportunities. Alternative D would provide intensive use on some acres, however opportunities would be limited in the number of acres proposed for roadless areas.

Cumulative Impacts

It is important to recognize effects will differ from community to community. For example, people moving into communities could help offset population and revenue losses that may occur if people leave the community due to job changes. A number of communities are experiencing increases in tourism, population growth, or recreation

demands, and these may act to offset some of the impacts of declining resource-related employment.

Economic Environment

Introduction

The human element is an important part of ecosystem management, and people are considered in resource decisions made in the Revised Plan. The management of the Routt National Forest affects local economies. Production of resources on the Forest and recreational use generate employment and income in the surrounding communities and counties. Federal payments in the form of 25% Funds and Payments in Lieu of Taxes provide local counties with revenues.

Legal and Administrative Framework

Impact analyses and economic efficiency in environmental documentation for forest plan revisions is primarily based on three laws and associated regulations:

- **National Environmental Policy Act (NEPA)** - NEPA requires disclosure of effects on the human environment, specifically identifying the social sciences and economic considerations.
- **National Forest Management Act (NFMA)** - NFMA requires comprehensive consideration of economic benefits and costs, specifically identifying the social sciences, economic considerations, cost-efficient alternatives, impacts on present net value, and impacts on local employment.
- **1990 Farm Bill (sections 2371-2374)** - The Farm Bill focuses on the national concern for the economic well-being of rural communities, especially as they may be dependent upon goods and services derived from National Forests.

Key Indicators

- Change in number of jobs.
- Change in income.
- 25% Payments.
- Present Net Value.

Affected Environment

Zone of Influence

To estimate the current condition and potential impact to local economies, a zone of influence for the economic environment was delineated. The zone of influence is comprised of Moffat, Routt, Jackson, and Grand counties in Colorado and Albany and Carbon counties in Wyoming. These counties interact to form a regional economy. Natural resources are the foundation of the economic base and generate a major portion of the region's business activity, employment and earnings. These resources include agricultural activities, such as livestock and crop production, minerals exploration and production, hunting, outdoor recreation and timber production.

Craig and Steamboat Springs, Colorado and Laramie, Wyoming are the major trade centers in the zone of influence. Kremmling, Walden, Hayden, and Oak Creek, Colorado and Saratoga, Wyoming are smaller trade centers within the region. Denver, Fort Collins, Grand Junction, and Cheyenne are major trade centers located outside the zone of influence. The counties within the zone of influence are very different in terms of employment, income, and economic diversity and dependency. Because of these differences, each county will also be assessed separately, in addition to the total economic zone of influence.

Employment and Income

Agriculture, wholesale and retail trade, services, energy and mineral development, and government are the major sources of business activity, employment, and earnings. The regional economy has experienced fluctuations in employment and personal earnings as a result of reductions in production and prices of commodities in agriculture and minerals industries. Communities throughout the study area have experienced declining workforces due to long-term decline in agriculture and fluctuations in minerals exploration and development. The one exception to this would be Steamboat Springs in Routt County. Steamboat Springs has experienced significant growth in the service and retail trade.

In real dollars, per capita income has increased overall in each county from 1983 to 1995 (see Figure 3-55). The one exception is Jackson County in which the 1995 per capita income was almost equal to the 1983 per capita income. In Jackson, Albany and Carbon counties, per capita income declined between 1983 and 1989 then increased between 1989 and 1995. All counties, except Routt, are below the 1995 national per capita income.

Figure 3-56 displays the unemployment rates for each county and state from 1983 to 1995. In most cases, the unemployment rate for the counties within the economic zone of influence is higher than the statewide averages

Unemployment rates have declined in all counties except Jackson, where unemployment has risen from 1991 to 1995. Unemployment rates are the highest in Moffat and Carbon Counties. Unemployment rates in Albany, Grand and Routt Counties are the lowest and are below state averages

Figure 3-55. Per Capita Personal Income in Constant (1996) Dollars by County

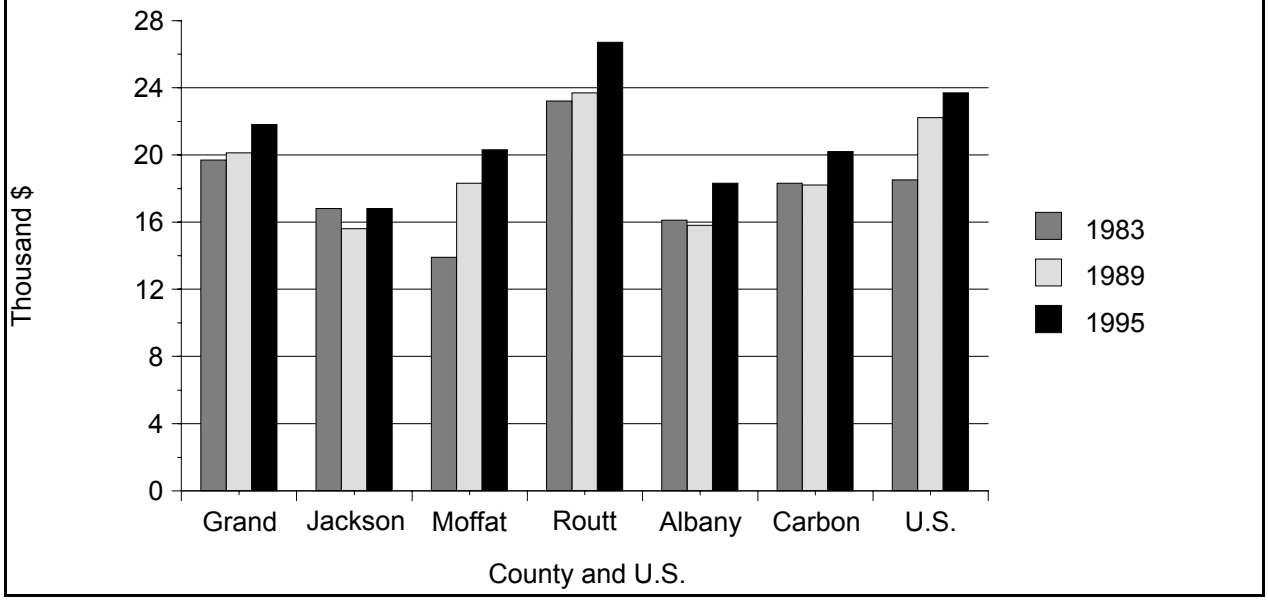
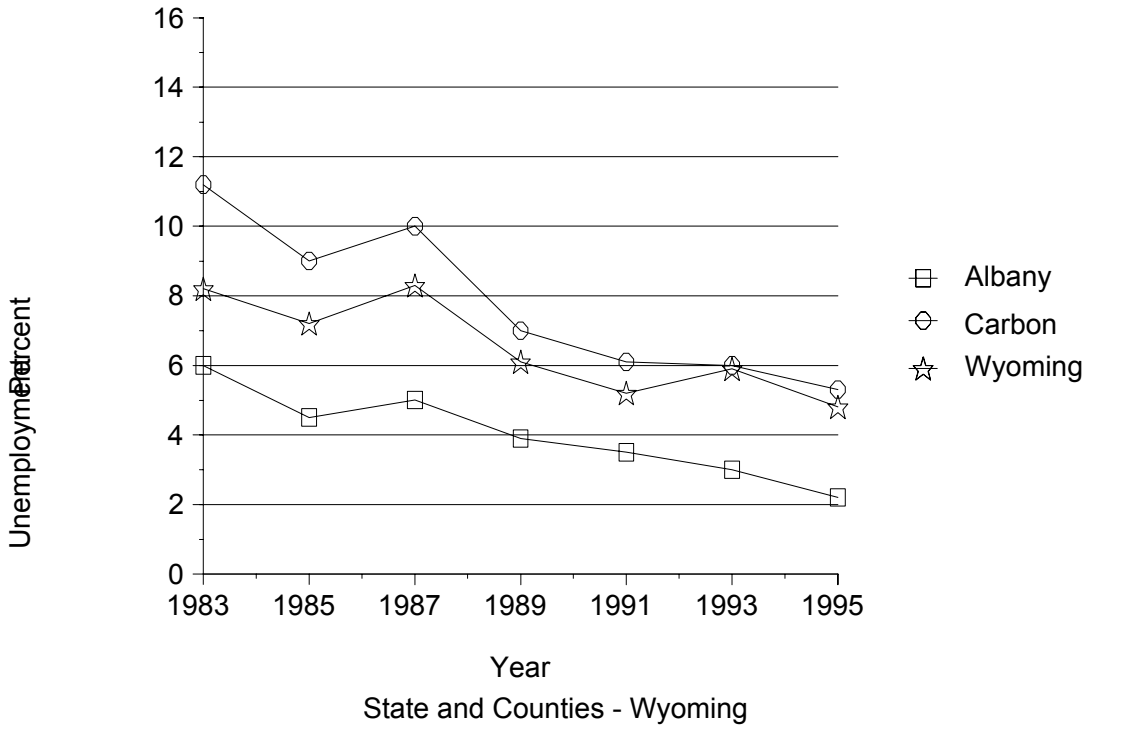
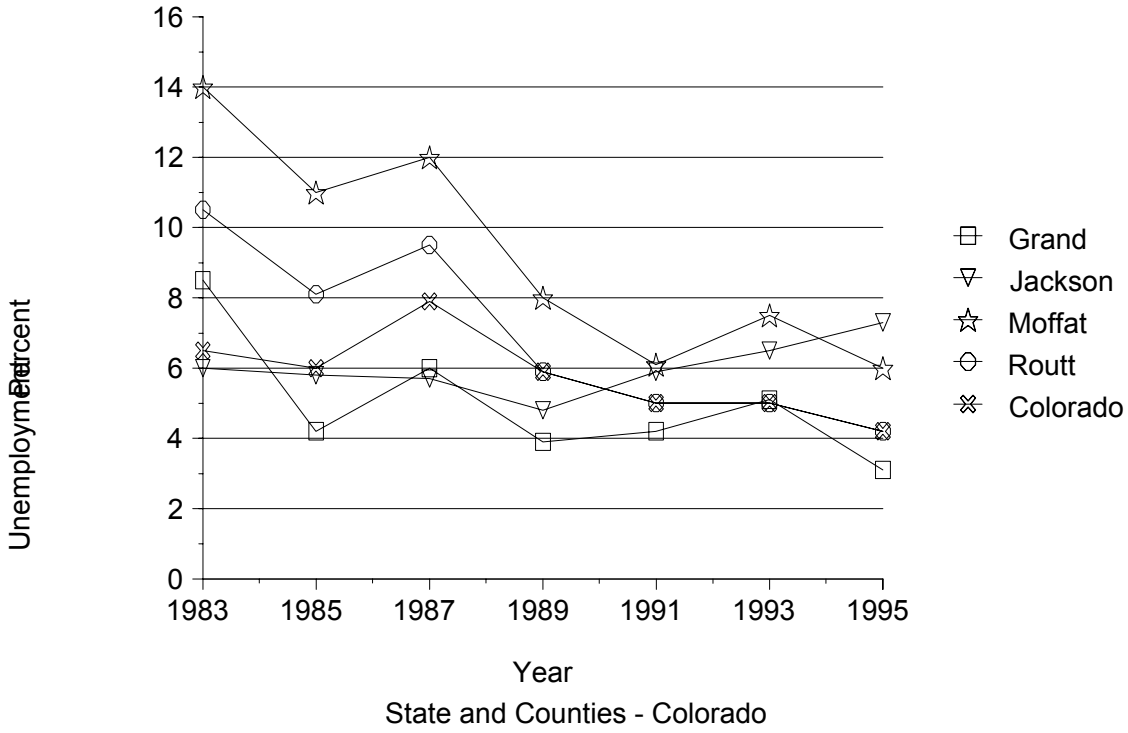


Figure 3-56. County and State Unemployment Rates



Source: Wyoming Department of Employment, Research, and Planning Division



Source: Colorado Department of Labor and Employment

Diversity and Dependency

Economic diversity is the strength of the economy, providing resilience in the face of sudden changes. Economic diversity is defined as the number of sectors in an area and the distribution of economic activity, such as employment and income, within each sector.

Another means of describing the regional economy is to look at economic dependency. Rural economies in the Rocky Mountain Region generally depend most on their exports to sustain their income and employment. On a relative basis, the larger the percentage of total exports in a given industry, the greater the dependence of the rural economy on that industry. This economic dependency analysis evaluates each industry to estimate the degree of dependence of the economy on the industry's exports. This dependency is expressed in terms of total income and employment.

Economic diversity and dependency were analyzed using economic income and product information found in the Forest Service's Micro-IMPLAN system. The economic data used in this analysis were for the years 1977 and 1991. See Appendix B for a complete description of the diversity and dependency analysis. After the DEIS was published, 1993 data became available in IMPLAN. The diversity and dependency analysis was rerun for the zone of influence. The updated analysis showed very little change from the 1991 data. Because of the small amount of change, the analysis completed for the DEIS remains valid for the FEIS.

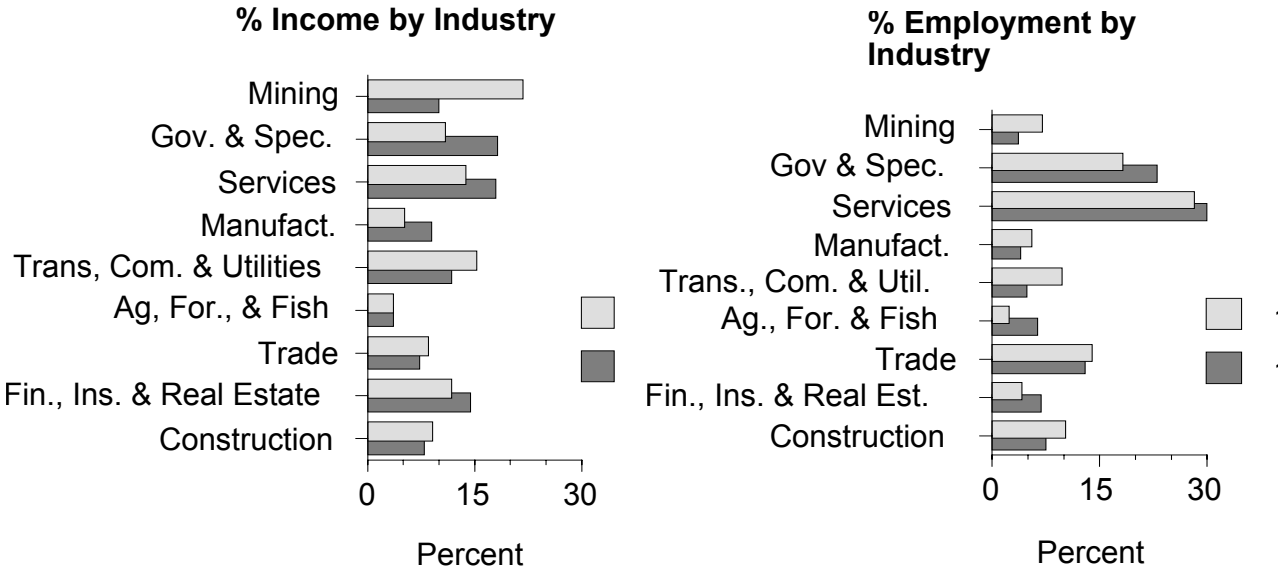
Industries and Forest Service Activities

For analysis and display purposes, economic sectors were aggregated to the industry level. One industry is composed of many sectors. The timber harvesting sectors are found under the manufacturing industry. Activities involved with grazing on the forest are found under the agriculture industry. Recreation activities are generally found in the service; trade; and transportation, communication, and utilities industries.

Regional Economy

Figure 3-57 displays the economic diversity in terms of employment and income for the regional economy, zone of influence, for the years 1977 and 1991. The service industry generates almost one-third of the employment in both years. In 1977, the industry producing the majority of income was mining, followed by the transportation, communication, and utilities industry. With a decline in mining employment since 1977, the industries producing the majority of income in 1991 were service and government industries, followed by the finance, real estate, and insurance industry.

Figure 3-57. Economic Diversity for Local Economic Zone of Influence

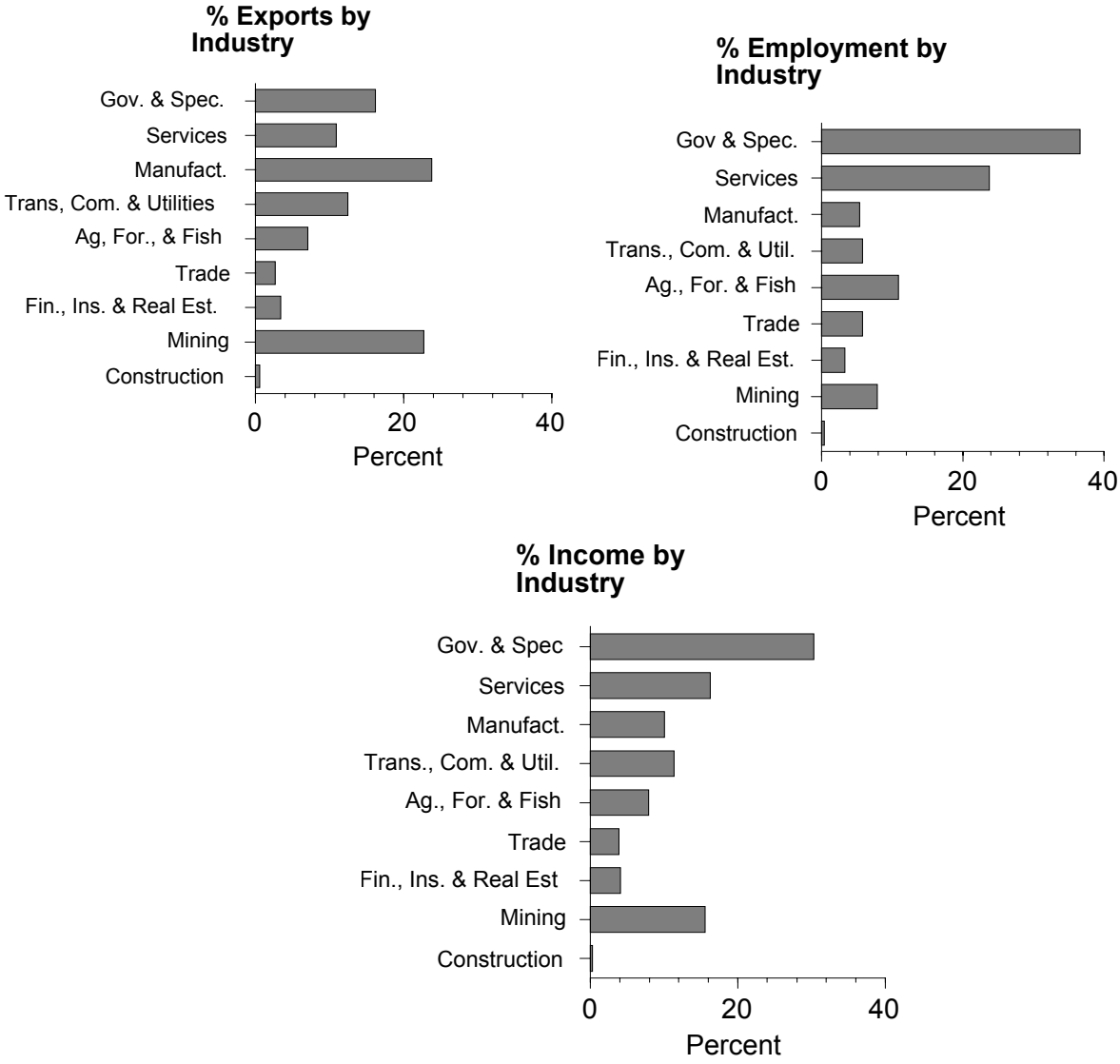


For the regional economy, there is good economic diversity, with employment and income spread throughout many industries. Service; government; trade; finance, real estate, and insurance; and transportation, communications, and utilities industries generate the majority of employment and income. This is reflective of the high amount of recreation that occurs on the Forest and local area. Furthermore, it indicates that recreation on the Forest has a large impact on the regional economy. Manufacturing and agriculture industries are also significant in the regional economy, adding to the economic diversity, but generating less of the overall income and employment. The production of sawtimber and grazing on the Forest has a lower impact on regional employment and income, but does affect the economic diversity of the area. In 1991, the mining industry continued to play a role in the regional economy, although at a reduced level from 1977.

Figure 3-58 shows the export, employment and total income dependency for the regional economy using 1991 data. The industries generating the highest percentage of exports are manufacturing and mining. However, since these two industries do not generate a large portion of the areas' jobs, they become less significant in terms of dependency. In terms of employment, the area's greatest dependency is on government (mostly state and local) and service, and to a lesser extent, agriculture. In terms of income, the area is most dependent on service; mining; government; and transportation, communication, and utilities.

The economic diversity and dependency and the impact of Forest activities varies greatly for each county. Because of these differences, each county was also analyzed for economic diversity. As with the regional economy, both 1977 and 1991 were analyzed to capture changes and trends.

Figure 3-58. Economic Dependency for Local Economic Zone of Influence – 1991



Grand County

Figure 3-59 displays the breakdown of employment and income by industry for Grand County for the years 1977 and 1991. The majority of employment is in the service industry, accounting for nearly one-half of the county's employment. In addition, the service industry generates nearly one-third of the income. The finance, real estate, and insurance industry also generates a large portion of the income. Grand County's economic diversity is similar to the regional economy, although lacking in the mining industry. Forest recreation has a large impact on this county's employment and income, while grazing and timber production have a lower impact in terms of overall employment and income.

Figure 3-59. Economic Diversity for Grand County

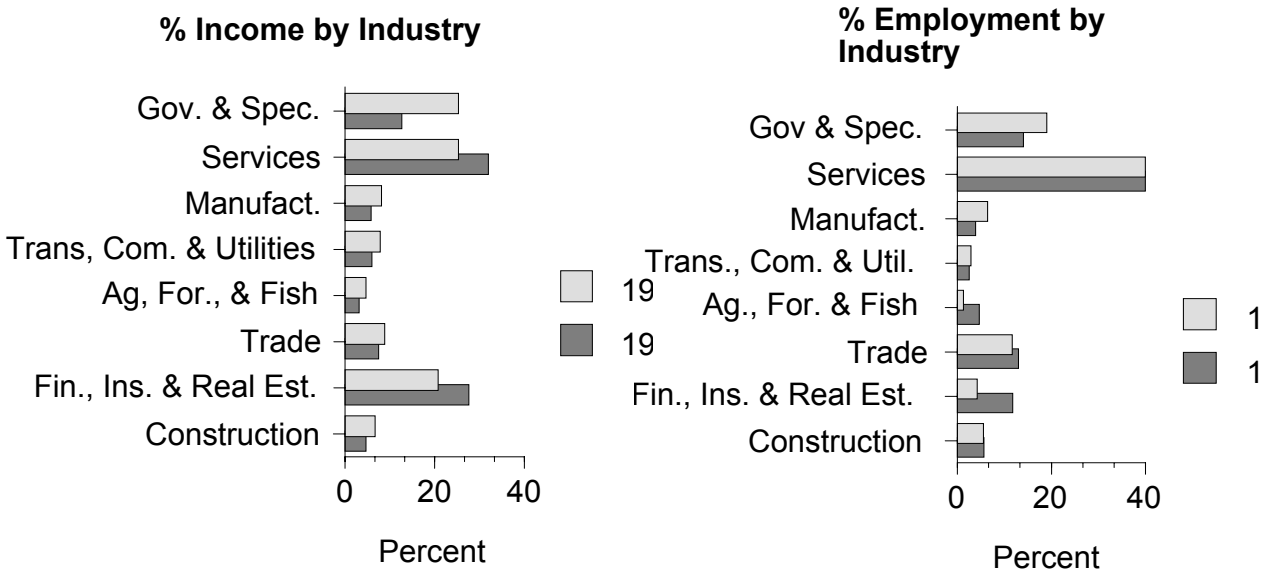
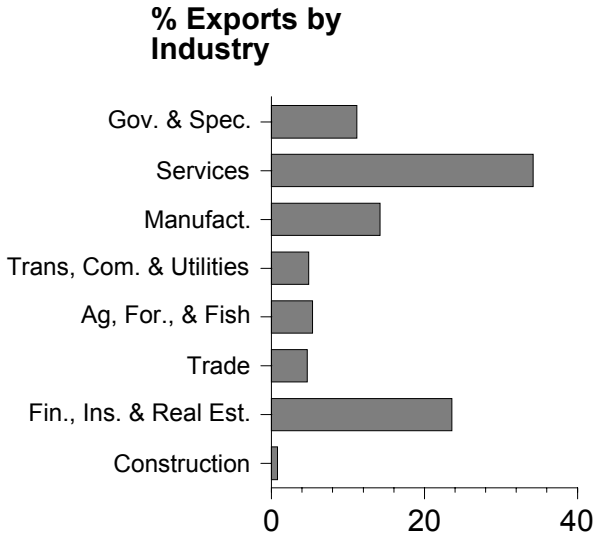
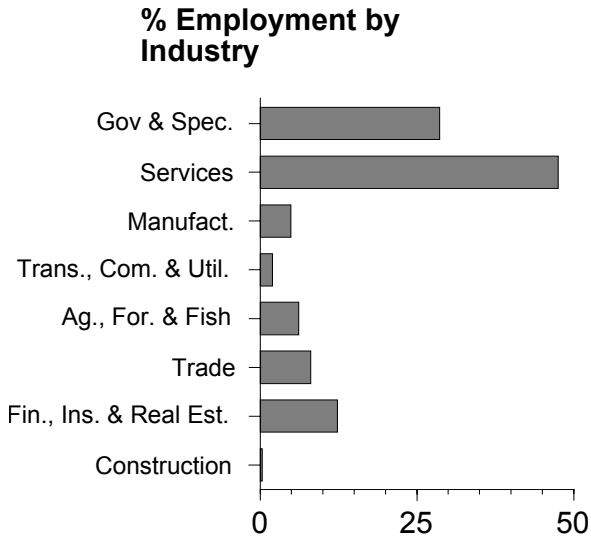
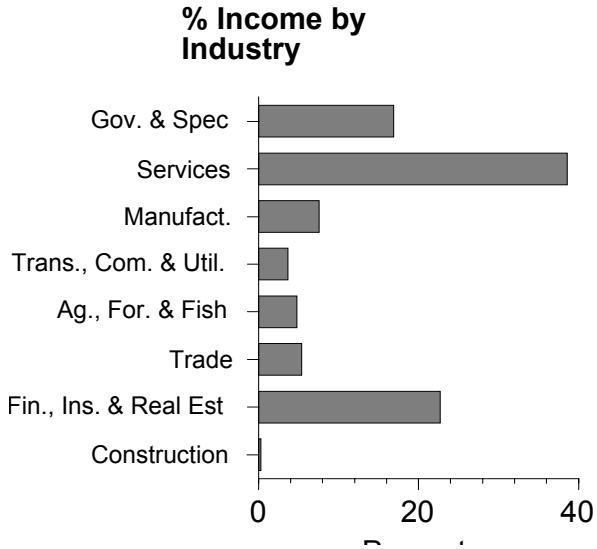


Figure 3-60 displays the economic dependency for Grand County using 1991 data. The majority of the exports is in the service and finance, real estate, and insurance industries, accounting for more than one-half of the county's exports. Similar to the diversity analysis, the dependency analysis shows that the county's employment and income are dependent on these two industries, plus government.

Figure 3-60. Economic Dependency for Grand County - 1991







Jackson County

Figure 3-61 displays the breakdown of employment and income by industry for Jackson County for the years 1977 and 1991. The county has experienced a shift in employment from 1977 to 1991. In 1977, the majority of employment was in the government sector, with agriculture and manufacturing following as close seconds. In 1991, the majority of employment shifted to the agriculture and service industries, with a decrease in government and manufacturing. Since that time, there has been a further decrease in the manufacturing industry with the closure of the Walden timber mill in 1994. There has also been a significant shift in the industries generating income from 1977 to 1991. In 1977, the majority of the income was generated by agriculture. In 1991, agriculture still generated a large portion of the income, but the role of the service industry had greatly increased.

Jackson County's economic diversity is similar to the regional economy, but with a much larger emphasis on agriculture and less emphasis on finance, real estate, and insurance. Within the agriculture industry, more than one-half of the activity is within the range-fed cattle economic sector. This indicates that grazing on the Forest has an impact on the county's employment and income. The growth in the service industry from 1977 to 1991 indicates that recreation on the Forest is also significant to this county's employment and income. Timber production from the Forest is important to the manufacturing industry. Although the manufacturing industry does not generate a large portion of the county's employment and income, it is important in maintaining the county's economic diversity.

Figure 3-61. Economic Diversity for Jackson County

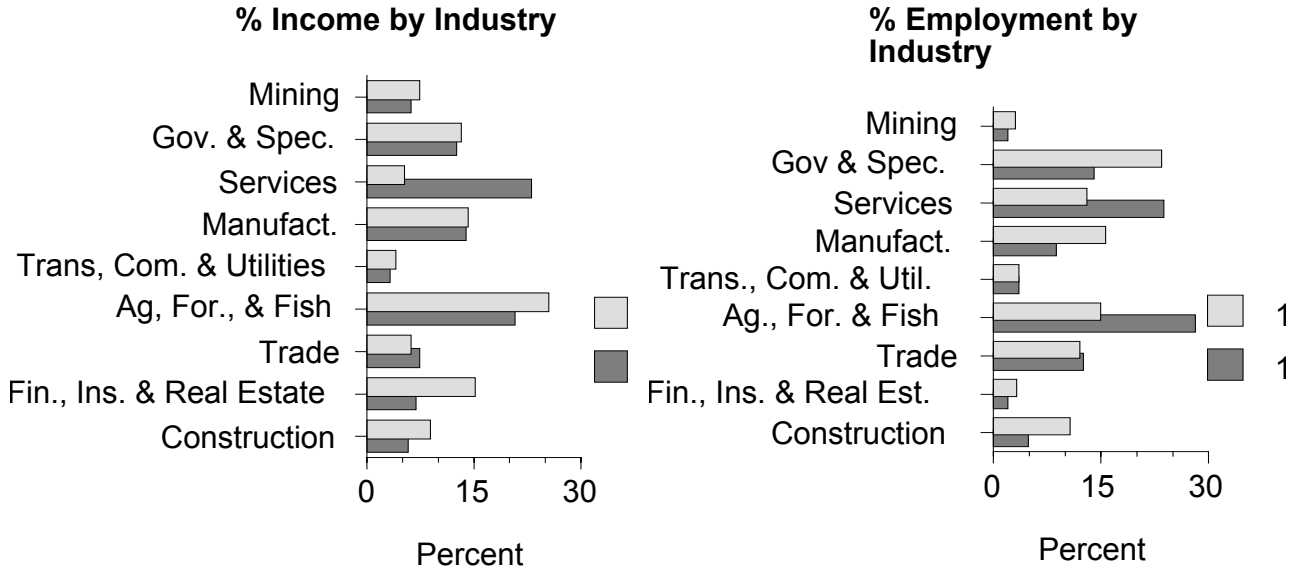
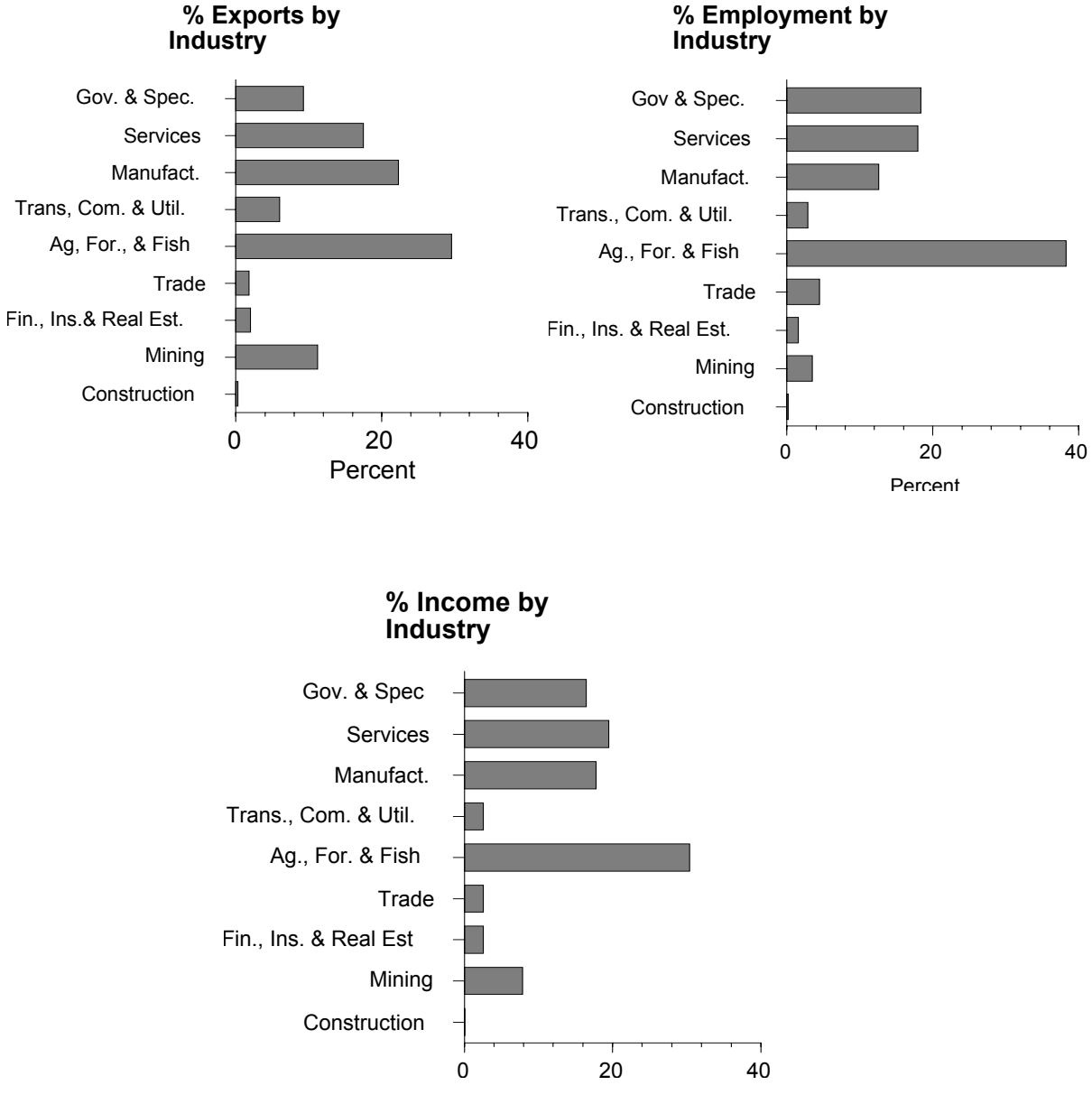


Figure 3-62 displays the economic dependency for Jackson County using 1991 data. The majority of the exports is in the agriculture, manufacturing, and service industries. The county is dependent on the agriculture industry in terms of both jobs and income. The service, manufacturing, and government industries are also important to economic dependency. With the closure of the Walden timber mill in 1994, the dependency on the manufacturing industry will have decreased. However, the 1991 data shows that the manufacturing industry has an important role in the county's employment and income.

Figure 3-62. Economic Dependency for Jackson County - 1991



Moffat County

Figure 3-63 displays the breakdown of employment and income by industry for Moffat County for the years 1977 and 1991. This county has undergone significant shifts in income and employment from 1977 to 1991. In 1977, the majority of employment was in the construction, service, and trade industries. In 1991, the role of construction had greatly decreased, with service and government increasing. In 1977, the majority of the county's income was generated by the construction and mining industries. In 1991, mining still generated a majority of the income. However, construction had fallen significantly from 1977 to 1991 with the transportation, communications, and utilities industry greatly increasing. In 1991, the mining industry and the transportation, communications, and utilities industry generated more than one-half of the county's income. The service and government industries had also grown from 1977 to 1991.

Moffat County's economic diversity is similar to the regional economy, but with a larger emphasis on mining and transportation, communications, and utilities, and slightly less emphasis on service and government. Because of the increased portion of jobs and income from the service industry, recreation on the Forest has an impact on this county's employment and income. Grazing on the Forest also has an impact on the county's employment and income in terms of increased diversity. Because the manufacturing industry in the county is small and decreased from 1977 to 1991, timber production from the Forest does not presently have a significant impact with regards to jobs and income, but does play a role in adding to the county's economic diversity.

Figure 3-63. Economic Diversity for Moffat County

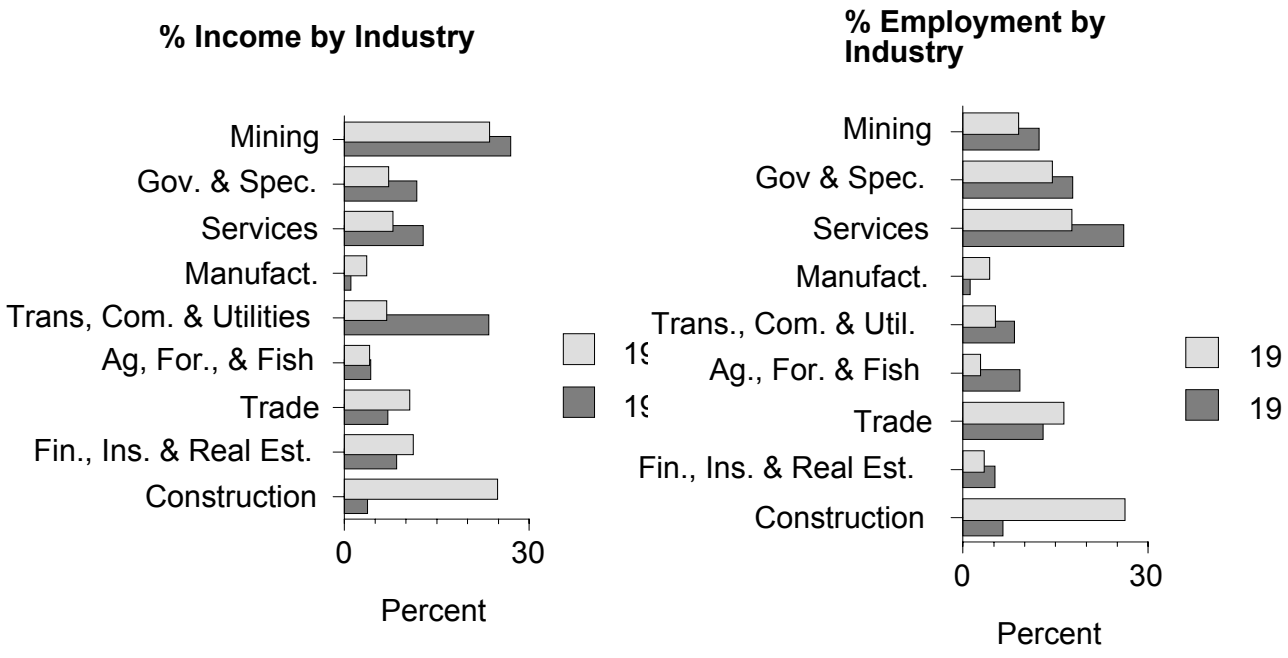
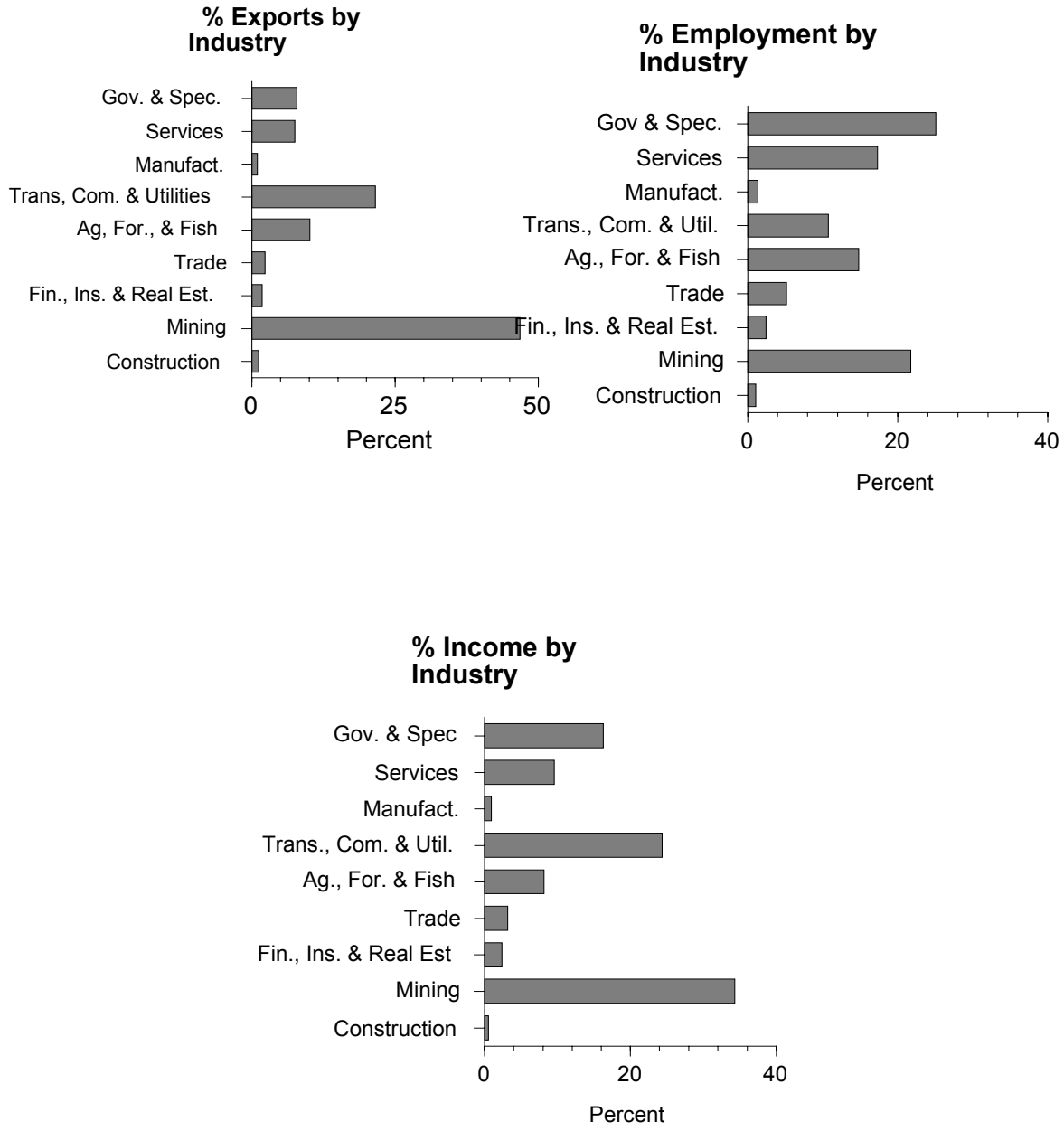


Figure 3-64 shows the export, employment and total income dependency for Moffat County using 1991 data. The industries generating the highest percentage of exports are mining and transportation, communications, and utilities. In terms of employment, the area's greatest dependency is on government, mostly state and local, mining, and service. In terms of income, the area is most dependent on mining; government; and transportation, communications, and utilities. Overall, the area's economy is most dependent on mining. Government; agriculture; service; and transportation, communications, and utilities also play important roles in the economy.

Figure 3-64. Economic Dependency for Moffat County - 1991



Routt County

Figure 3-65 displays the breakdown of employment and income by industry for Routt County for the years 1977 and 1991. The composition of the economy has been relatively stable. In 1977, the service industry was the major employer, with trade and government also accounting for large portions of the jobs. In 1991, service was still the major employer. The proportion of jobs generated by construction increased from 1977 to 1991, while trade and government decreased. In 1977, finance, real estate, and insurance and mining generated the majority of the income in the county. In 1991, the finance, real estate, and insurance industry still generated the majority of the income. The proportion of the income generated by the service and construction industries increased from 1977 to 1991, while mining and transportation, communications, and utilities decreased.

Routt County's economic diversity is similar to the regional economy, but with a larger emphasis on service; construction; and finance, real estate, and insurance and a smaller emphasis on manufacturing and government. Recreation on the Forest has a significant effect on this county's employment and income. Grazing on the Forest has an impact on the county's agricultural industry, which is important in maintaining the county's economic diversity. Because there is no sawmill in the county, timber production from the Forest does not presently impact income and employment. However, an increase in the manufacturing industry would improve the county's economic diversity.

Figure 3-65. Economic Diversity for Routt County

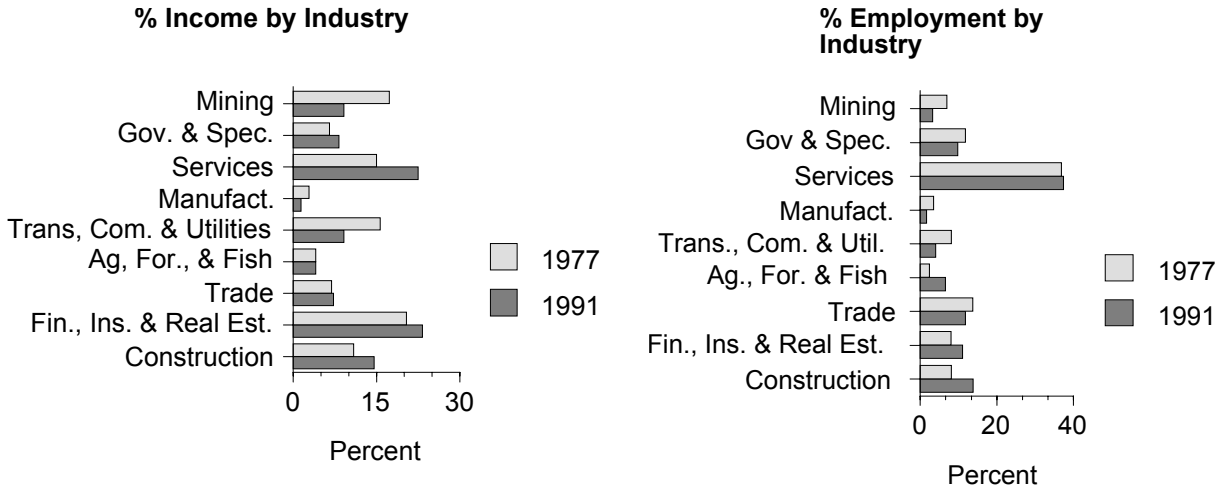
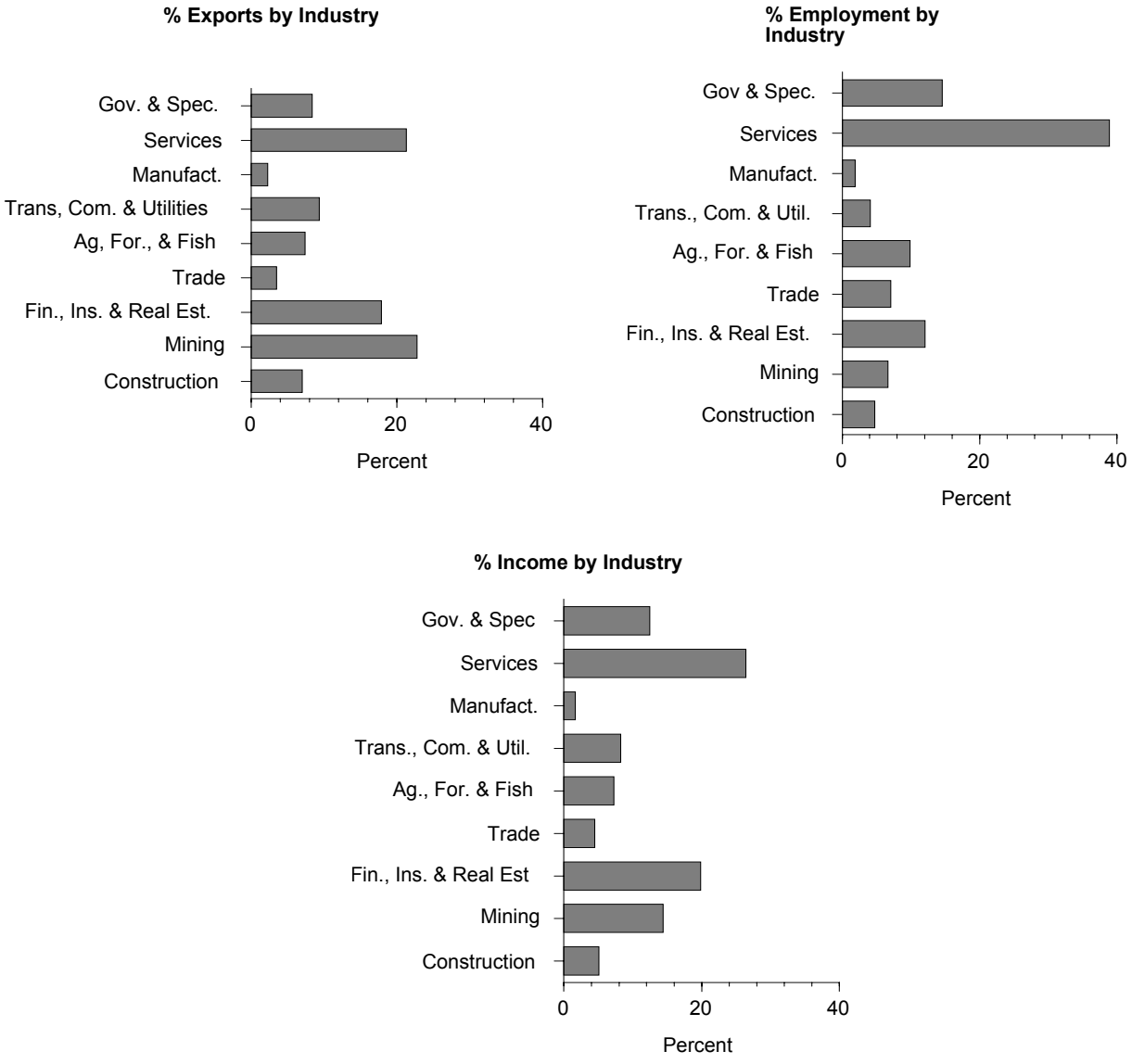


Figure 3-66 shows the export, employment and total income dependency for Routt County using 1991 data. The industries generating the highest percentage of exports are mining; service; and finance, real estate, and insurance. In terms of employment, the area's greatest dependency is on the service industry. Government and finance, real estate, and insurance also play important roles in terms of employment. In terms of income, the county is most dependent on service, with finance, real estate, and insurance and government also playing significant roles. Overall, the area's economy is dependent on service.

Figure 3-66. Economic Dependency for Routt County - 1991



Albany County

Figure 3-67 displays the breakdown of employment and income by industry for Albany County for the years 1977 and 1991. The industry composition in this county has remained relatively stable from 1977 to 1991. In both 1977 and 1991, the majority of the employment was generated by the service, trade, and government industries. Employment from the government industry increased from 1977 to 1991. Within this industry, the majority of activity is within the state and local government economic sector. The trade and service industries decreased from 1977 to 1991, but still played significant roles in 1991. As for income, the finance, real estate, and insurance; service; and government sectors generated the majority of the income in both 1977 and 1991. As with employment, the amount of income generated by state and local government increased from 1977 to 1991. The service and finance, real estate, and insurance sectors decreased slightly from 1977 to 1991.

Albany County's economy has a larger emphasis on the government industry and a lower emphasis on agriculture; finance, real estate, and insurance; and mining than does the regional economy. Because of the large amount of jobs and income generated by the service industry, recreation on the Forest has an effect on this county's employment and income. Grazing on the Forest also has an impact on the county's agricultural industry, which is important in maintaining the county's economic diversity. Timber production from the Forest is important to the manufacturing industry. Although the manufacturing industry does not generate a large portion of the county's employment and income, it is important in maintaining the county's economic diversity.

Figure 3-67. Economic Diversity for Albany County

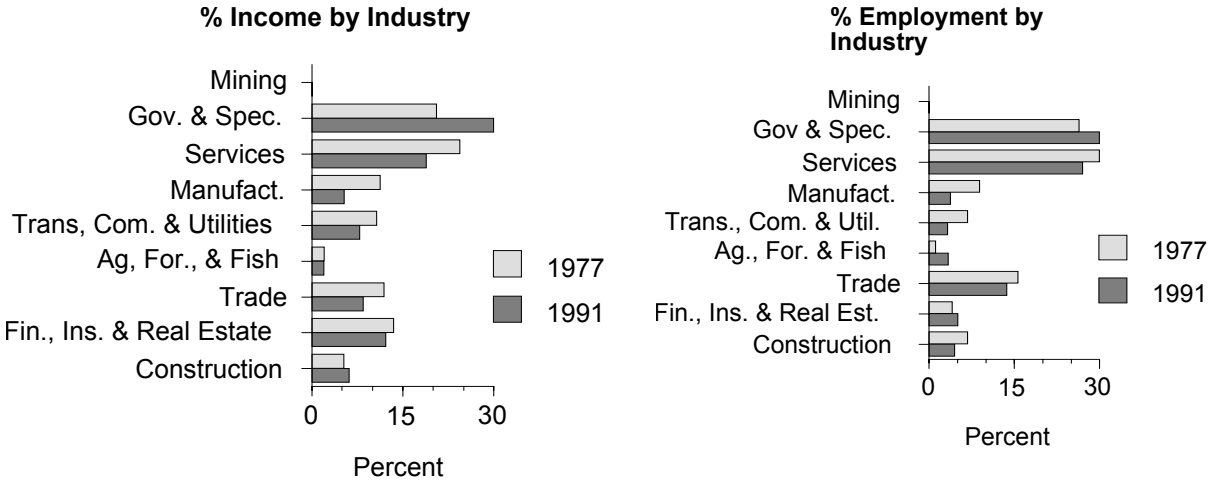
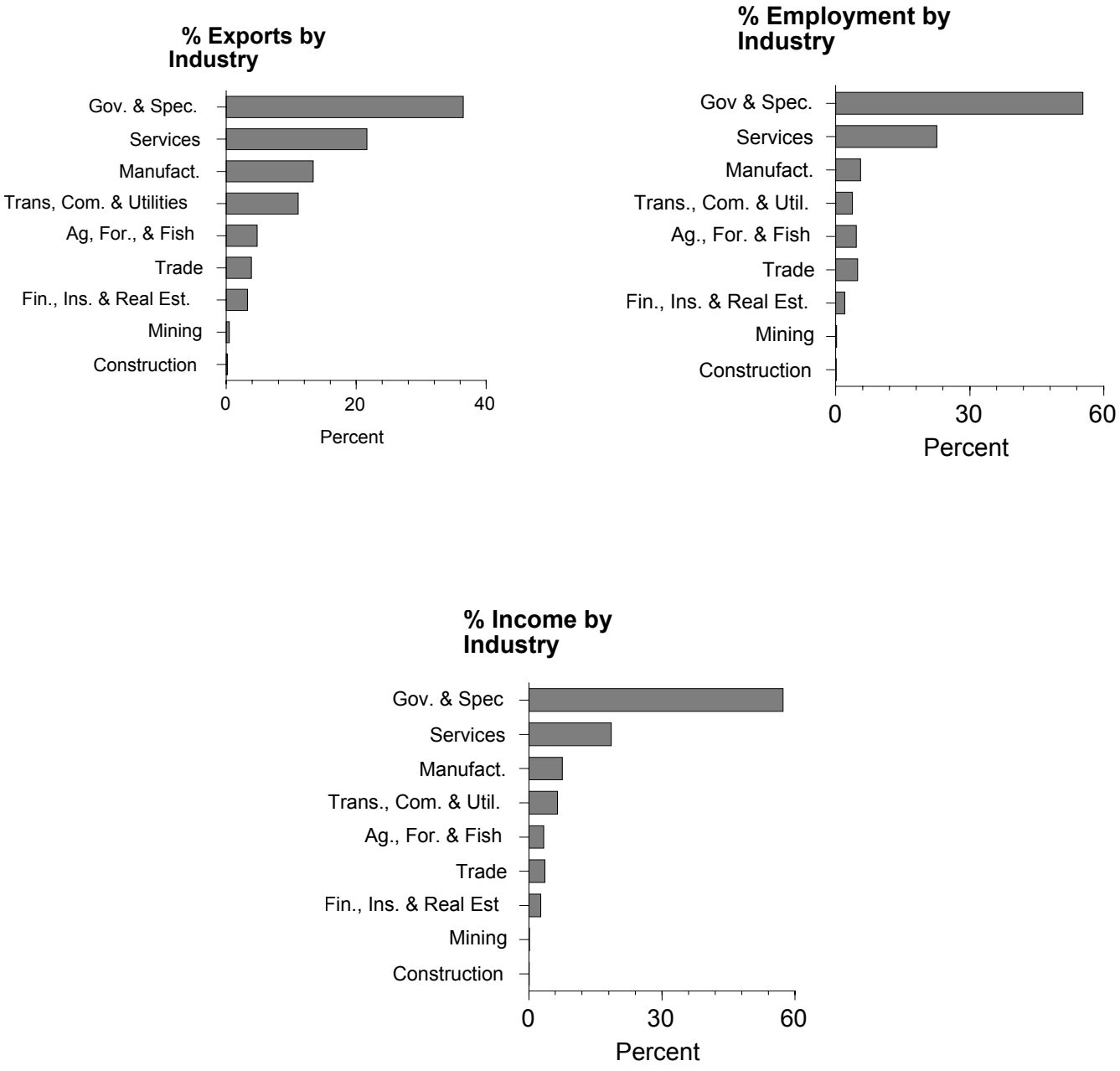


Figure 3-68 shows the export, employment and total income dependency for Albany County using 1991 data. The industries generating the highest percentage of exports are government (state and local) and service. In terms of employment, the area's greatest dependency is on government. In terms of income, the area is most dependent on government. This county's economy is highly dependent on the state and local government sector, with service also playing a significant role.

Figure 3-68. Economic Dependency for Albany County – 1991



Carbon County

Figure 3-69 displays the breakdown of employment and income by industry for Carbon County for the years 1977 and 1991. The industry composition of this county has undergone significant changes from 1977 to 1991. In 1977, the major employers were transportation, communications, and utilities; service; and mining. In 1991, the majority of employment was in the service and government industries. The mining and transportation, communications, and utilities industries decreased from 1977 to 1991. In 1977, the majority of the income was generated by the mining and transportation, communications, and utilities industries. In 1991, manufacturing accounted for the majority of the income. As with employment, the proportion of the county's income generated by the mining and transportation, communications, and utilities industries decreased from 1977 to 1991.

Carbon County's economic diversity has a larger emphasis on agriculture, mining, and manufacturing and less emphasis on service than does the regional economy. Recreation on the Forest is important to this county's employment and income, though at a lower level than for the regional economy. Within the agriculture industry, more than one-half of the activity is within the range-fed cattle economic sector. This indicates that grazing on the Forest has an impact on the county's employment and income. Timber production from the Forest is important to the manufacturing industry. Although the manufacturing industry generates a large amount of the county's income and a lower proportion of the employment, the sawmill economic sector within this industry is at a lower level. The petroleum refining economic sector generates the majority of jobs and income within this industry. However, even though the sawmill sector is small for the county as a whole, this sector is important to the employment and income for the towns of Encampment and Saratoga.

Figure 3-69. Economic Diversity for Carbon County

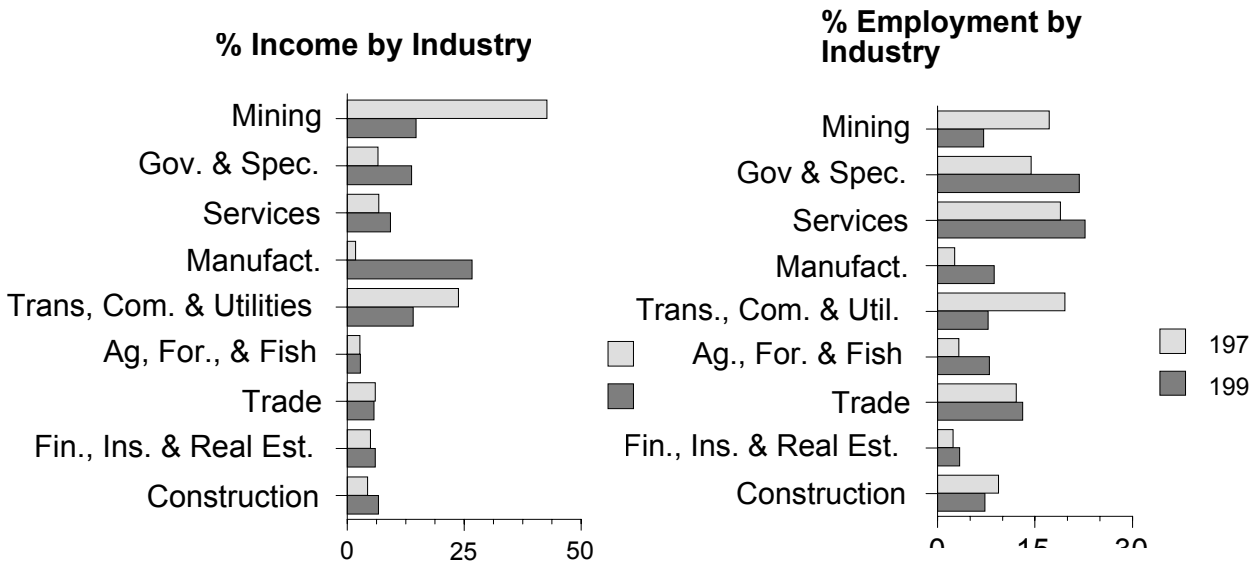
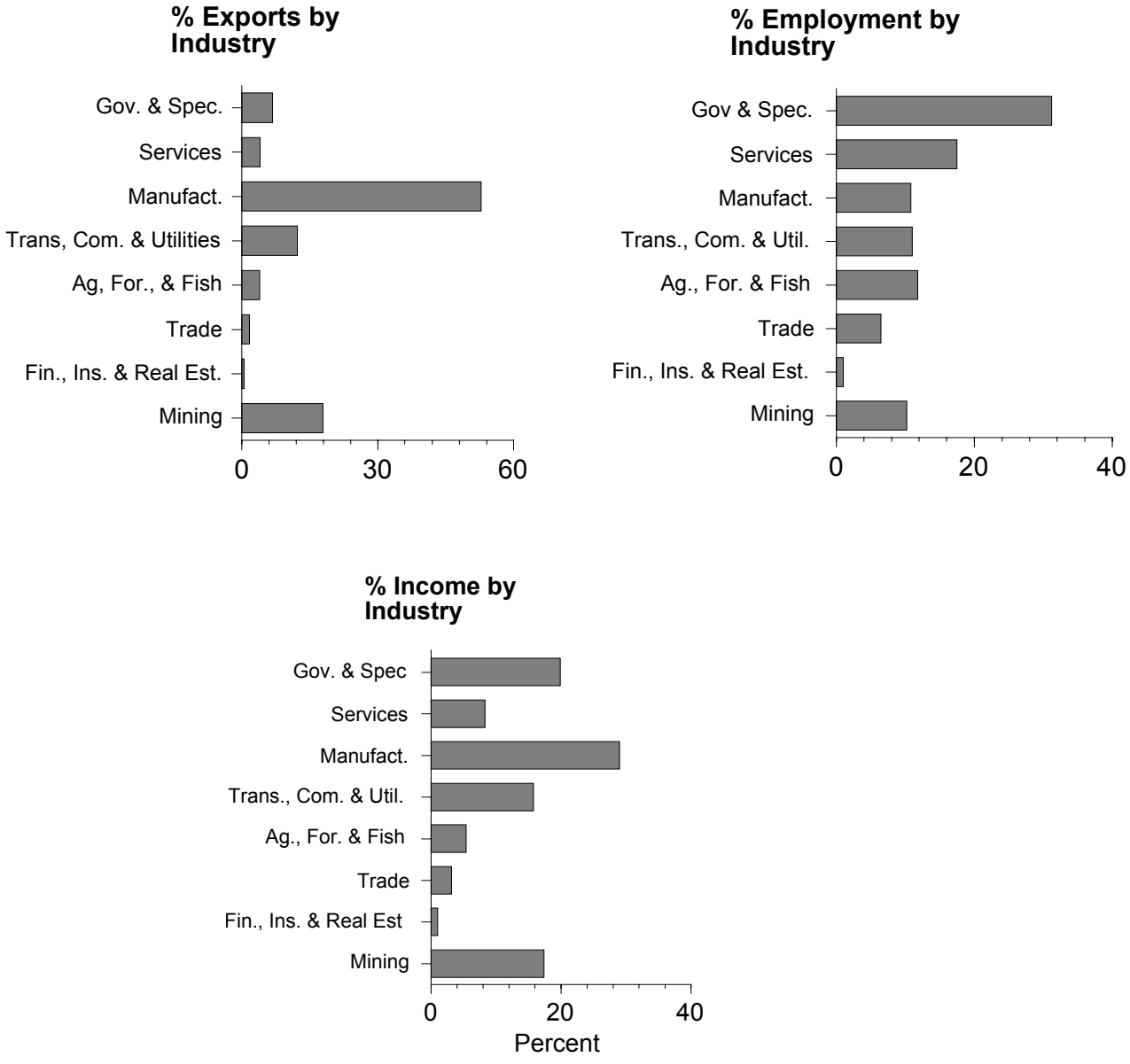


Figure 3-70 shows the export, employment, and total income dependency for Carbon County using 1991 data. The industry generating the highest percentage of exports is manufacturing. The majority of these exports are within the petroleum refining sector. In terms of employment, the area's greatest dependency is on government (mostly state and local) and service. In terms of income, the area is most dependent on manufacturing (the petroleum refining sector); government; mining; and transportation, communications, and utilities. Overall, the county's economy is most dependent on manufacturing, specifically, petroleum refining. However, government; service; mining; and transportation, communications, and utilities also play significant roles.

Figure 3-70. Economic Dependency for Carbon County - 1991



National Forest Contribution to Local Economy

Table 3-96 shows the annual income and employment that the Routt National Forest contributes to the local (zone of influence) economy. The table indicates that a large percentage of the jobs and income generated are due to recreation, more specifically, downhill skiing on the Forest.

Table 3-96. National Forest Annual Contributions to Local Economy

Resource Groupings	Income (millions of 1996 dollars)			Employment (# of FTEs)		
	Total	% of Local	% of NF	Total	% of Local	% of NF
Local Economy						
Total	2,338.7	100.0		57,384	100.0	
National Forest						
Rec., Wildlife, Fish	128.9	5.5	90.2	7,191	12.5	93.8
Skiing	80.0	3.4	56.0	4,277	7.4	55.8
All Other RWF	48.9	2.1	34.2	2,914	5.1	38.0
Range	0.5	0.0	0.3	28	0.0	0.4
Timber	4.3	0.2	3.0	208	0.4	2.7
FS Expenditures	8.7	0.4	6.1	221	0.4	2.9
Payments to Cnty	0.5	0.0	0.3	19	0.0	0.2
Nat'l Forest Total	142.9	6.1	100.0	7,667	13.3	100.0

Source: IMPLAN impact analysis

Forest Receipts

Table 3-97 shows the net receipts by resource area for fiscal years 1994-1996. Funds generated by the portion of the Arapaho National Forest that is administered by the Routt National Forest is not included in this table. Funds generated by this part of the Forest are reported by the Arapaho.

Table 3-97. Net Receipts by Resource for the Routt National Forest (excluding a portion of the Arapaho National Forest administered by the Routt) in Thousands of 1996 Dollars

Resource	1994	1995	1996	3-Year Avg
Timber	2,374.4	1,714.5	2,648.8	2,245.9
Land Use	14.4	13.9	8.7	12.3
Rec. Special-Use	845.9	793.0	713.8	784.2
Minerals	0.2	0.1	0.0	0.1
Campgrounds	114.1	91.9	160.4	122.1
Grazing	123.8	95.1	70.0	96.3
Total	3,472.8	2,708.5	3,601.7	3,261.0

Source: Payments to States report

Net Returns to Counties

The Twenty-Five Percent Fund, an act created in 1908, requires 25% of revenues received by the Forest from the sale of Forest products and permits to be returned to counties containing National Forest System lands. Receipts from timber sales, grazing fees and the Steamboat Springs Ski Area are the primary source of monies (see Table

3-97). The percent of Forest land area in each county is the basis for the distribution of the 25% funds returned to each county. Counties receiving 25% payments from the Routt National Forest are Garfield, Grand, Jackson, Moffat, and Rio Blanco. Carbon and Albany counties in Wyoming receive 25% payments from the Medicine Bow National Forest.

The money that each county receives from the Forest Service must be spent on public works and schools. In Colorado, 95% of the money received is spent on roads and 5% on schools. Table 3-98 lists payments to counties made by the Routt National Forest for fiscal years 1994-1996. Payments from the portion of the Arapaho National Forest that is administered by the Routt National Forest are not included in this table. Payments made by this part of the Forest are reported by the Arapaho National Forest.

Table 3-98. Payments to Counties from the Routt National Forest (excluding a portion of the Arapaho National Forest administered by the Routt) in Thousands of 1996 Dollars

County	1994	1995	1996	3-Year Avg
Garfield	27.2	21.2	28.2	25.5
Grand	31.2	24.3	32.3	29.3
Jackson	253.5	197.7	262.9	238.0
Moffat	29.4	22.9	30.5	27.6
Rio Blanco	85.8	66.9	88.9	80.5
Routt	441.2	344.1	457.6	414.3
Total	868.3	677.1	900.4	815.2

Source: Payments to States report

To assess the impact of the Routt National Forest's 25% returns to counties, the total county budget for those counties within the economic zone of influence was compared to the 25% returns. Table 3-99 shows the county budget and the percentage that is contributed by the Forest. For all four counties, only a small percentage of the county budget is from this source of funding. Jackson County is most affected by the 25% funds. In 1994, the percent of the county budget derived from 25% funds increased to 4.6%. Although this information is from 1992 and 1993, the representation should still hold true for more current years.

Table 3-99. County Budgets and 25% Returns to Counties (in Thousands of 1994 Dollars)

County	1992 Budget	% from Routt NF	1993 Budget	% from Routt NF
Grand	10,638.6	0.1%	10,873.2	0.2%
Jackson	6,493.8	1.8%	5,319.5	2.8%
Moffat	22,208.1	0.1%	20,590.2	0.1%
Routt	17,231.3	1.2%	16,124.2	1.6%

Source: Personal communication with counties

Local counties also receive Payments in Lieu of Taxes (PILT). Under the PILT Act of 1976, Congress provided for payments to local units of government, typically counties, containing certain federally owned lands. These payments are designed to supplement other federal land receipt sharing payments received by local governments.

PILT authorizes payments under one of two alternatives, based on the number of acres of entitlement land within the county. Payments are subject to a ceiling based on county population. One alternative takes into account the prior year payments; the other alternative does not. Under Alternative A, the "total calculated payment" is reduced by the amount of certain federal land payments that were received by the county in the preceding fiscal year. These include payments made to the county from National Forest receipts, mineral leasing, and sales of land and materials. Alternative B payments are calculated based on the number of entitlement acres and is not adjusted for previous years federal payments. Counties then receive payments under the formula, or alternative, that results in the highest payment.

In 1996, all counties in the economic zone of influence, except Garfield, received payments under Alternative B. Garfield County received payments under Alternative A. Table 3-100 lists the PILT paid to each county in 1995 and 1996. Figures are total PILT payments and include all federal lands. Figures are not available on PILT paid on only Routt National Forest lands within each county.

Table 3-100. PILT Payments to Counties

County	1995	1996
Garfield	274,655	345,787
Grand	93,120	87,664
Jackson	47,998	56,518
Moffat	155,153	182,686
Rio Blanco	139,161	163,863
Routt	62,862	72,785

Source: 1995 and 1996 PILT reports

Environmental Consequences

General Effects

Counties within the economic zone of influence are affected by the management activities, uses and outputs of the Routt National Forest. The actual economic impact from the Forest is different for each county because the economic diversity and dependency for each county varies. Based on the county economic diversity and dependency analysis, an assessment was made as to which resources from the National Forest affect each county. Table 3-101 summarizes whether a resource from the Forest has an impact or not for each county.

Table 3-101. Forest Economic Influence by County

County	Recreation	Timber	Range
Grand	Yes	No	No
Jackson	Yes	Yes	Yes
Moffat	Yes	No	Yes
Routt	Yes	No	No
Albany	Yes	Yes	No
Carbon	Yes	Yes	Yes

All counties within the zone of influence are affected by recreation on the Forest. Moffat and Jackson counties are mostly affected by hunting. Grand and Routt counties are affected by all forms of recreation, on a year-round basis. Timber has the largest

impact on Carbon and Albany counties. If the mill in Walden was to reopen, timber would also affect Jackson County. The largest impacts from range are on Jackson, Moffat, and Carbon counties.

Direct and Indirect Effects

Effects on Income and Employment

Changes in Forest Service expenditures (salaries, equipment, contracts), the production of natural resources (timber and grazing), and uses of the Forest (recreation) have direct and indirect effects on local jobs and income. An increase in recreation or timber production may mean an increase in jobs and income to local counties. In addition, if production is decreased in one resource and increased in another, there is a shifting of jobs from one industry to another. The Forest used an input/output model (IMPLAN PRO) to estimate the change in direct and indirect income and employment for each alternative. See Appendix B for a complete discussion of this analysis.

Table 3-102 displays the change in employment and Table 3-103 the change in income for the zone of influence by alternative. Figures are displayed for both the desired condition and experienced budget levels. Changes are listed by resource. The base year of 1994 was used as a starting point for total jobs and income. Thus, the tables reflect how jobs and income would decrease or increase from 1994 levels. Recreation related jobs tend to be within the service industry and are low paying. Since range related jobs are often family oriented, these jobs are also low paying. Timber related jobs tend to be higher paying. Thus, an increase in recreation or range jobs does not generate as high of an increase in income as would timber.

Table 3-102. Change to Employment by Alternative

		Number of Jobs Increase or Decrease						
Resource	**Base Yr (1994)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Experienced Budget Level								
Recreation & Wildlife	7,191	+1,841	+1,962	+1,965	+1,950	+1,937	+1,777	+1,918
Rec-Ski only	4,277	+1,106	+1,106	+1,106	+1,106	+1,106	+1,106	+1,106
Timber	208	-63	-123	-84	-78	-61	-150	-56
Range	28	-3	-6	-5	-5	-3	-9	-3
FS Expend.	221	-14	-20	-17	-17	-13	-24	-12
Payments to Counties	19	-2	-4	-4	-3	-2	-9	-2
Total	7,667	+1,758	+1,809	+1,856	+1,846	+1,859	+1,586	+1,845
Desired Condition Level								
Recreation & Wildlife	7,191	+1,841	+1,963	+1,965	+1,950	+1,938	+1,777	+1,918
Rec-Ski only	4,277	+1,106	+1,106	+1,106	+1,106	+1,106	+1,106	+1,106
Timber	208	+74	-92	-24	0	+110	-150	+69
Range	28	+4	0	+1	+1	+4	-4	+4
FS Expend.	221	+76	+39	+54	+57	+92	+25	+89
Payments to Counties	19	+7	-4	+1	+9	+10	-8	+7

Total	7,667	+2,003	+1,906	+1,997	+2,017	+2,154	+1,640	+2,087

Source: IMPLAN impact analysis

Table 3-103. Change to Income by Alternative

		Millions of Dollars - Increase or Decrease (1996 dollars)						
Resource	**Base Yr (1994)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Experienced Budget Level								
Recreation & Wildlife	128.9	+33.6	+35.6	+35.6	+35.4	+35.2	+32.6	+34.8
Rec-Ski only	80.0	+20.7	+20.7	+20.7	+20.7	+20.7	+20.7	+20.7
Timber	4.3	-1.3	-2.5	-1.7	-1.6	-1.2	-3.1	-1.1
Range	0.5	0.0	-0.1	-0.1	-0.1	0.0	-0.2	0.0
FS Expend.	8.7	-0.5	-0.8	-0.7	-0.7	-0.5	-0.9	-0.5
Payments to Counties	0.5	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.0
Total	142.8	+31.6	+32.1	+33.1	+32.9	+33.3	+28.3	+33.2
Desired Condition Level								
Recreation & Wildlife	128.9	+33.6	+35.6	+35.6	+35.4	+35.2	+32.6	+34.9
Rec-Ski only	80.0	+20.7	+20.7	+20.7	+20.7	+20.7	+20.7	+20.7
Timber	4.3	+1.5	-1.9	-0.5	0.0	+2.3	-3.1	+1.4
Range	0.5	+0.1	0.0	0.0	0.0	+0.1	-0.1	+0.1
FS Expend.	8.7	+3.0	+1.6	+2.1	+2.2	+3.6	+1.0	+3.5
Payments to Counties	0.5	+0.2	-0.1	0.0	+0.2	+0.3	-0.2	+0.2
Total	142.8	+38.4	+35.2	+37.3	+37.9	+41.4	+30.3	+40.0

Source: IMPLAN impact analysis

Tables 3-102 and 3-103 indicate that total jobs and income will increase for all alternatives. However, this increase is primarily due to an increase in recreation on the Forest. Recreation remains relatively constant and at a higher level than in 1994 for all alternatives. The increase in recreation is due to increased populations and interest in recreation. This increase in recreation-related jobs and income would have positive effects on all the counties within the zone of influence, with the greatest impact on Routt and Grand Counties.

Under the experienced budget level, jobs and income generated from timber decrease under all alternatives. The alternatives with the greatest loss to jobs and income from timber production is Alternatives F and B. Alternatives G, E, and A have the lowest impact on timber related jobs and income. The decrease in timber related jobs and income under the experienced budget level would have negative affects on Carbon and Albany counties. Jackson County may also be negatively impacted because reduced timber production levels could contribute to the mill in Walden remaining closed. Under the desired condition level, jobs and income generated from timber would increase under alternatives E, A, and G. There would be no change to timber-related jobs and income under alternative D and a slight decrease under alternative C. Alternatives F and B show the greatest loss to timber-related jobs and

income. As explained earlier, Carbon and Albany counties would be negatively impacted by a reduction in timber-related jobs and income.

Jobs and income generated by grazing on the Forest also decrease under all alternatives for the experienced budget level. However, the size of the decrease to range-related jobs and income for most alternatives is very small. The decrease in range-related jobs and income would negatively impact Jackson, Moffat, and Carbon Counties.

At the desired condition level, range-related jobs and income remain constant or increase slightly under all alternatives except F. There is a slight decrease to range-related jobs and income under Alternative F. Because of the very small changes, no county would affected by the changes to jobs and income generated by range.

The row titled as 'FS Expend.' in Tables 3-102 and 3-103 reflects the changes to jobs and income from Forest expenditures. Under all alternatives at the experienced budget level, there would be a slight decrease in local jobs and income due to lower Forest budgets, with the greatest decrease occurring under Alternative F. Conversely, all alternatives show an increase in local jobs and income due to higher Forest budgets at the desired condition level. A change to jobs and income due to Forest expenditures would affect all the counties within the zone of influence.

The row titled as 'Payments to Counties' in Tables 3-102 and 3-103 reflects the changes to jobs and income from the 25% payments to counties. Under all alternatives at the experienced budget level, there would be a slight decrease in local jobs and income due to lower 25% payments to counties, with the greatest decrease occurring under Alternative F. At the desired condition level, all alternatives except F and B show a slight increase to jobs and income from higher 25% payments to counties. A change to jobs and income due to 25% payments to counties would have the greatest affect on Jackson and Routt counties.

Overall, Alternative F has the largest negative impact on local jobs and income because of reduced timber and grazing-related jobs. Alternative B also has a negative impact on local jobs and income in the timber-related jobs, but not as greatly as Alternative F. At the experienced budget level, Alternatives C, D, A, E, and G also have a negative impact on local jobs and income in the timber-related jobs. At the desired condition level, Alternatives E, A, and G have the largest positive impact on local jobs and income because of higher timber production levels.

Effects on Returns to Counties

Table 3-104 displays the estimated 25% payments to counties resulting from revenues generated by the Forest for each alternative. Actual payments will vary based on production levels and actual timber prices. Alternatives G, E, and A will generate the highest level of returns to counties. Alternative F will have the lowest level of returns. However, for all alternatives the affect of 25% payments on budgets for counties within the zone of influence is small. For the counties within the zone of influence, the 25% payments is a very small portion (less than 5%) of the total county budget. The item that would be affected the most would be county roads.

Counties also receive PILT. The PILT payments may be adjusted when 25% payments fluctuate. The change to PILT was calculated for each county based on 1995 PILT payments. For Garfield County, PILT payments would increase or decrease under all alternatives to completely offset any change (decrease or increase) in 25% funds. For

Routt County, PILT payments would increase under all alternatives by the same amount as the decline to 25% funds and decrease by $1,309 for any increase in 25% funds. The remaining counties (Grand, Jackson, Moffat, and Rio Blanco) would have no adjustment to PILT for any alternative.

Table 3-104. Twenty-Five Percent Payment to Counties (in Thousands of 1996 Dollars)								
County	**Base Yr (1994)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Experienced Budget Level								
Garfield	27.2	23.7	20.6	21.4	22.2	23.9	14.5	24.4
Grand	31.2	27.3	23.8	24.7	25.6	27.6	16.8	28.1
Jackson	253.5	222.4	193.6	201.4	208.3	224.7	136.7	229.2
Moffat	29.4	25.6	22.3	23.2	24.0	25.9	15.8	26.4
Rio Blanco	85.8	75.2	65.4	68.0	70.4	75.9	46.2	77.4
Routt	441.2	386.5	336.5	349.9	361.9	390.4	237.5	398.2
Total	868.3	760.8	662.2	688.6	712.3	768.4	467.4	783.7
Desired Condition Level								
Garfield	27.2	37.7	20.8	27.8	30.1	41.3	14.7	37.3
Grand	31.2	43.6	24.0	32.1	34.7	47.7	16.9	43.0
Jackson	253.5	354.8	195.1	261.4	282.9	388.4	138.0	350.3
Moffat	29.4	40.9	22.5	30.1	32.6	44.8	15.9	40.4
Rio Blanco	85.8	119.9	65.9	88.3	95.6	131.2	46.6	118.4
Routt	441.2	616.5	339.0	454.3	491.5	674.8	239.7	608.7
Total	868.3	1,213.3	667.3	894.1	967.4	1,328.2	471.8	1,198.0

Source: Quattro Pro spreadsheet on Routt PNV analysis

Effects on Economic Efficiency

The main criterion used in assessing economic efficiency is Present Net Value (PNV), which is defined as the value of discounted benefits minus discounted costs. A PNV analysis includes all outputs, including timber, grazing, and recreation, to which monetary values are assigned. The monetary values include both market and nonmarket values. See Appendix B for a description of these values and the economic analysis.

In addition, a financial efficiency analysis is completed to determine the financial returns of each alternative. A financial efficiency analysis is the PNV of federal revenues and costs.

Table 3-105 displays the economic and financial PNV for each alternative. All monetary values are expressed in constant dollars with no allowance for inflation. A 4% discount rate was used over a 50-year period (1996 - 2045). The reduction of PNV in any alternative as compared to the most financially or economically efficient solution is the economic trade-off, or opportunity cost, of achieving that alternative.

As shown in Table 3-105, the financial PNV is negative for all alternatives at both the full implementation and experienced budget levels. Conversely, the economic PNV is positive for all alternatives at both budget levels. Under both budget levels, the

alternative with the lowest economic PNV is Alternative F. The alternative with the highest economic PNV is Alternative E, under both the full implementation and the experienced budget levels. However, as Table 3-105 indicates, differences between alternatives for PNV are slight.

Some outputs or effects, such as biological diversity, visual amenities, and social and economic impacts on local communities have no monetary value or cost. The cost of achieving these nonmonetary outputs is included in the economic and cost-efficiency analyses. Net public benefit is defined as the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) for producing those primary benefits, whether they can be quantitatively valued or not. Thus, net public benefits conceptually are the sum of PNV plus the full value of nonpriced outputs.

Table 3-105. Economic and Financial Efficiency (in Thousands of Dollars)

Full Budget Level	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Returns to US Treasury-decade 1	4,853.2	2,669.1	3,576.5	3,869.5	5,312.6	1,887.3	4,791.9
25% Payment to Counties-decade 1	1,213.3	667.3	894.1	967.4	1,328.2	471.8	1,198.0
Present Value Revenues	104,946.1	62,502.7	78,019..0	83,967.1	114,876.0	43,832.8	103,829.9
Present Value Benefits	2,250,016.2	2,209,565.9	2,235,303.3	2,235,005.8	2,278,240.7	2,034,939.6	2,259,164.9
Present Value Costs	242,233.1	212,415.8	223,903..	226,336.3	255,595.0	200,751.0	252,652.0
Financial PNV	137,287.0	149,913.1	145,911.3	142,369.2	140,719.1	156,918.3	148,822.1
Economic PNV	2,007,783.1	1,997,150.1	2,011,373.0	2,008,669.5	2,022,645.6	1,834,188.6	2,006,513.0
Experienced Budget Level							
Returns to US Treasury-decade 1	3,043.1	2,648.8	2,754.5	2,849.4	3,073.7	1,869.5	3,135.0
25% Payment to Counties-decade 1	760.8	662.2	688.6	712.3	768.4	467.4	783.7
Present Value Revenues	67,114.8	59,859.6	61,304.2	63,333.1	67,858.1	43,221.5	69,174.2
Present Value Benefits	2,176,436.1	2,173,924.9	2,184,508.6	2,181,038.0	2,197,458.6	2,004,449.8	2,189,580.3
Present Value Costs	169,021.8	164,274.3	166,486.9	166,229.1	170,010.0	161,051.9	170,676.0
Financial PNV	101,907.0	104,414.7	105,182.7	102,896.1	102,151.9	117,830.5	101,501.7
Economic PNV	2,007,414.3	2,009,650.6	2,018,021.6	2,014,808.8	2,027,448.6	1,843,397.9	2,018,904.4

Source: Quattro Pro spreadsheet on Routt PNV analysis

When evaluating trade-offs, the use of PNV and net public benefit is often misunderstood. In each alternative, PNV was maximized in an attempt to ensure that

the alternative would be efficient in its use of tax dollars and land. The economic and financial PNVs coupled with indicators for such goals and objectives as supporting the economies of local communities, maintaining biological diversity, and providing pleasing visual qualities, can be used to estimate net public benefits, compare alternatives and assist in choosing a preferred alternative.

Cumulative Effects

Management of the Routt National Forest has an impact on the economics of local counties. However, there are many additional factors that influence and affect the local economies. Management of adjacent National Forests, such as the Medicine Bow, Arapaho-Roosevelt and White River, affect the counties in much the same way as the Routt National Forest. Management of adjacent forests and their output levels and uses will compound the impact on local jobs and income and payments to counties. If timber and range production decreases on adjacent forests, there will be an increased impact on local jobs and income, especially under Alternatives B and F. If timber and range production increased on an adjacent forest, there would be less of an impact on local jobs and income, even under Alternatives B and F.

Additional factors that influence local economies is population growth, economic growth, and the economic diversity and dependency of individual counties. The counties that are less dependent on natural resource production levels, such as Routt, Grand and Albany Counties, will have little effect from the alternatives. The counties that are dependent to some degree on natural resource production levels, such as Jackson, Moffat and Carbon Counties, will be adversely affected by Alternatives B and F.

Potential Conflicts with Goals or Objectives of Other Agencies

The Forest has coordinated with various agencies in the formulation of alternatives; the development of goals, objectives, and standards and guidelines; and other important aspects of the revision process. Consultations include American Indian tribes; the Bureau of Land Management; U.S. Fish and Wildlife Service; Colorado Division of Wildlife; and other local, state, and federal agencies. For a chronological list of coordinations accomplished, please see Appendix A. The administrative record, located at the Forest Supervisor's office in Laramie, WY, contains proceedings of each of the coordination efforts.

The alternatives, associated effects, forest-wide standards and guidelines, and management area prescriptions are generally compatible and compliment the goals and objectives of land management agencies adjacent to or near the Forest. The following summary is provided to help define areas of potential differences between the Forest Service policies, management, and responsibilities and those of other agencies.

Mitigating effects from mining activities could result in conflicts with federal mining laws. The U.S. Mining Laws Act of 1872 predates all other laws that govern Forest Service activities. Conflicts could arise between the mining activities allowed under the act and other resources, such as scenery, water, sensitive plants and animals, or recreation.

Federal requirements and authorities for maintenance and protection of water resources may conflict with the State of Colorado's administration of water rights.

The Forest is cooperating with the Colorado Division of Wildlife to investigate potential declines in big game hunting opportunities on the Forest. Increasing road densities and reductions in cover may be partially responsible for elk and other big game leaving the Forest prior to the fall big game hunting season.

Resource Commitments

Energy Requirements for Implementing the Alternatives

Energy is consumed in the administration and use of natural resources from the Forest. For the purpose of the Revised Plan, energy sources are gasoline, diesel fuel, liquefied petroleum, natural gas, electricity, and wood. Although many activities consume energy, the following are considered significant in the implementation of any alternative:

- Energy consumed in timber harvesting is the amount required for felling, bucking, skidding, loading, hauling, for performing road maintenance, and for the industrial traffic associated with harvest activities.
- Energy consumed in utilizing range vegetation is the amount required for hauling stock to and from the range and for permittee range improvement activities (watering, salting, and herding).
- Energy consumption related to recreation is based on the estimated number of dispersed and developed recreation visitor days, estimated trip lengths, and facility construction.
- Energy consumed in road construction and reconstruction activities is that used by contractors or Forest Service crews in completing road development.
- Energy consumed by Forest Service administrative activities includes vehicle use; lighting, heating, and cooling of buildings; and fuel used in such equipment as small engines and burners.

Unavoidable Adverse Effects

The application of forest-wide standards and guidelines and resource protection measures would limit the extent and duration of any adverse environmental effects. Nevertheless, some adverse effects are unavoidable. For detailed disclosure of all effects, including unavoidable adverse effects, see the preceding Environmental Consequences discussions for each resource area (air, biological diversity, recreation, minerals, etc.).

Hazardous Materials

The use of motor vehicles and the transport of hazardous materials such as gasoline, other fuels, and building materials on roads and highways carry the potential for accidental spills.

Relationship Between Short Term Uses of the Environment and Long Term Productivity

Short-term uses are those expected to occur on the Forest over the next ten years. These uses include, but are not limited to, recreation use, grazing, mineral development, timber harvest, and prescribed burning. Long-term productivity refers to the capability of the land to provide resource outputs for a period of time beyond the next ten years.

The minimum management requirement established by regulation (36 CFR 219.27) provides for the maintenance of long-term productivity of the land. Minimum management requirements prescribed by the forest-wide standards and guidelines will

be met under all alternatives. Minimum requirements assure that long-term productivity of the land will not be impaired by short-term uses.

Monitoring, as described in Chapter 4 of the Revised Plan, applies to all alternatives. One purpose of monitoring is to assure that the long-term productivity of the land is maintained or improved. If monitoring and subsequent evaluation indicates that forest-wide standards and guidelines are insufficient to protect long-term productivity, the Revised Plan will be amended.

Although all alternatives were designed to maintain long-term productivity, there are differences between alternatives in the long-term availability or condition of resources. There may also be differences between alternatives in long-term expenditures necessary to maintain desired conditions. These types of differences between the alternatives are described in Chapters 2 and 3.

Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources is defined in Forest Service Handbook 1909.15 (2/21/95).

> The irreversible commitment of resources means that nonrenewable resources are consumed or destroyed. Examples include mineral extraction, which consumes nonrenewable minerals, and potential destruction of such things as heritage resources by other management activities. These consumptions or destructions are only renewable over extremely long periods of time.
>
> The irretrievable commitment of resources are opportunities foregone. They represent trade-offs in the use and management of forest resources. Irretrievable commitment of resources can include the expenditure of funds, loss of production, or restrictions on resource use.

Decisions made in a forest plan do not represent actual irreversible or irretrievable commitment of resources. A forest plan determine what kind and levels of activities are appropriate on the Forest; it does not make site-specific or project decisions. The decision to irreversibly or irretrievably commit resources occurs:

1. When the Forest Service makes a project or site-specific decision.
2. At the time Congress acts on a recommendation to establish a new wilderness or to include a river in the Wild and Scenic River System.

Previous to the Revised Plan, the Oil and Gas Leasing Analysis of 1993 determined that certain lands of the Forest would be made available for oil and gas leasing. This analysis is on file at the administrative site in Steamboat Springs and is incorporated by reference into the Revised Plan. Essentially, this analysis allows the Bureau of Land Management to conditionally authorize certain National Forest System lands for oil and gas exploration and production (36 CFR 228.102(e). Although surface disturbance cannot occur on leased land without further analysis and decision-making, issuance of a lease confers certain rights on the lessee and therefore represents a commitment of resources.

In addition to lands in Zones 1, 2, and 3 that were analyzed under the Oil and Gas Leasing Analysis of 1993, lands in Zone 4 were analyzed in the Revised Plan. Little potential for development exists on Zone 4 lands. The effects of the exploratory and developmental wells were analyzed and disclosed for all alternatives.

Examples of irretrievable resource commitments associated with Revised Plan decisions are as follows:

- Commodity outputs and uses (such as motorized recreation) would be curtailed or eliminated in areas recommended for and subsequently designated as wilderness, Wild and Scenic Rivers, Research Natural Areas, and some Special Interest Areas.
- Opportunities for nonmotorized recreation, solitude, and primitive or wilderness experiences would be foregone if portions of the Forest are not allocated or recommended for and subsequently designated for these purposes.
- Timber volume outputs would be foregone on lands determined as not suitable for harvest.
- Commodity outputs would be reduced or foregone on areas allocated to specific uses or purposes, such as developed recreation sites, old growth habitat, or botanical areas.
- Noncommodity values, including scenic resources, may be reduced or foregone in areas allocated to commodity uses.
- To the degree that an alternative preserves or encourages the development of mature and old-growth habitat, opportunities to develop early successional habitat are reduced.